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# TASO Evaluation Report: Analytics for Wellbeing Trials (University of Staffordshire)

Technical report

March 2026

**Project title:** Randomised controlled trials to test the impact of wellbeing interventions prompted by learning analytics in higher education (University of Staffordshire)

**Higher education provider:** University of Staffordshire

**Evaluators:**

- **Impact Evaluation:** The Policy Institute, King's College London
- **Implementation and Process Evaluation:** University of Staffordshire

**Project contributors:**

- **The Policy Institute, King's College London:** Susannah Hume, Beti Baraki, Megan Liskey, Parnika Purwar
- **University of Staffordshire:** Christina Matthews, Jo Blaiklock, Kirstie Brookes, Vanessa Dodd
- **TASO:** Dr Rob Summers, Christoph Koerbitz, Luke Arundel, Mikayla Boginsky
- **QA (Impact Evaluation):** Dr Patrick Taylor (BIT)

TASO



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VERSION	DATE	REASON FOR REVISION/NOTES
1.1	10 March 2026	Updated summary findings to reconcile differences with detailed results. Updated introduction to include more recent citations. Added details about business-as-usual support. Copy edited report to fix grammatical errors and improve readability.
1.0 [original]	10 February 2026	Reviewed by external reviewer.
Pre-registration	29 October 2024	This design has been pre-registered on Open Science Framework <sup>1</sup>

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<sup>1</sup> TASO (2024, October 29). Analytics for Wellbeing trials - University of Staffordshire. Retrieved from [osf.io/nd2hb](https://osf.io/nd2hb)

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## Acknowledgements

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# 1. Summary

This study evaluates the impact of a wellbeing-focused learning analytics intervention delivered at the University of Staffordshire (UoS) to support undergraduate students exhibiting early signs of academic disengagement. At weeks 5, 7, and 9 of the first semester of the 2024/25 academic year, students in the treatment group with less than 60% attendance received a notification through an institutional app on their smart devices highlighting their low engagement and linking to support services. This evaluation examines whether or not the notification had any impact on students' academic engagement, interaction with support services or wellbeing.

Table 1: Summary of evaluation details

Intervention	Engagement nudges: Wellbeing interventions prompted by analytics <sup>2</sup>
Intervention type	Learning analytics (post-entry)
Higher education provider	University of Staffordshire
Evaluator	The Policy Institute, King's College London (Impact Evaluation) University of Staffordshire (Impact and Process Evaluation (IPE))
Evaluation design	Randomised Controlled Trial (RCT) IPE
Comparison Group	Business-as-usual: students in the control group have access to the app but do not receive the push notification. They can also access support through Academic Services at their discretion.
Sample size	2,277 students (in-scope sample) <ul style="list-style-type: none"><li>• 1,137 students in the treatment group</li></ul>

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<sup>2</sup> The title of the intervention has been updated from "Wellbeing interventions prompted by analytics" as indicated in the trial protocol.

	<ul style="list-style-type: none"> <li>• 1,140 students in the control group</li> </ul> <p>660 students (analytical sample)</p> <ul style="list-style-type: none"> <li>• 327 students in the treatment group</li> <li>• 333 students in the control group</li> </ul>
Outcome measures	<p>Primary outcomes:</p> <ul style="list-style-type: none"> <li>• Student engagement: <ul style="list-style-type: none"> <li>○ Logins to the Virtual Learning Environment (VLE)</li> <li>○ Attendance at timetabled sessions</li> </ul> </li> </ul> <p>Secondary outcomes:</p> <ul style="list-style-type: none"> <li>• Progression to the university's tiered support model</li> <li>• Attendance at support services appointments</li> <li>• Wellbeing (GP-CORE)</li> </ul>

UoS delivered a learning analytics-driven wellbeing intervention aimed at first year full-time home undergraduate students showing signs of low engagement with their studies. This evaluation used a mixed-methods approach to understand both the impact and implementation of the intervention.

To assess the impact of the app-based nudge, a two-armed RCT was conducted by the Policy Institute at King's College London (KCL). The RCT involved 2,277 first year full-time undergraduate students who were randomly assigned to either the treatment group or the control group, with randomisation stratified by department type. The analytic sample was 660 students who fell below the 60% attendance threshold in any monitored period (treatment group  $n=327$ ; control group  $n=333$ ). Within the analytic sample, participants assigned to the treatment group received up to three notifications via UoS's Beacon app, encouraging them to engage with support. The RCT assessed changes in student engagement using outcome measures such as logins to the VLE, attendance at timetabled classes, progression to formal support, attendance at support appointments and self-reported wellbeing using the GP-CORE scale. Subgroup analyses were used to explore differences in outcomes by ethnicity, mature student status, socio-economic background, and department.

In addition to the impact evaluation, UoS designed and delivered an IPE of the analytics-based app notification. Using a mixed-methods approach, the IPE focused on understanding how the interventions were delivered and explored the experiences of both the students and staff involved. Drawing on a range of data sources, including interviews with students and staff and data from management information systems, it examined the adherence of the intervention to the plan, and which students were more likely to fall below the engagement threshold and trigger repeated notifications of low engagement. The IPE also investigated the perspectives of the stakeholders who delivered the intervention and of students who received it, to understand the relationship between them. Overall, the IPE complements the impact evaluation, providing further insights into the factors shaping the intervention's effectiveness.

### **Summary of findings**

Based on the primary analysis of the in-scope sample, the evaluation produced the following results:

- The treatment had no significant impact on VLE logins or attendance rates.
- In the two weeks following the intervention, there were, on average, approximately 3.02 Blackboard logins onto Blackboard by the students in the treated group and 2.68 logins in the control group, a difference of 0.34 (95% CI: -0.09 to 0.77). This difference is not statistically significant.
- During the second week after the intervention, on average, the treatment group had an attendance rate of 33.67%, while those in the control group had an attendance rate of 32.89%, a difference of 0.78 percentage points (95% CI: -1.59 to 3.16). This difference is not statistically significant.
- Across the first semester (October-December 2024), the likelihood of progression to UoS tiered support services was 17.13% for treatment group while it was 16.03% for control group, a difference of 1.1 percentage points [95% CI: -0.01 to 2.35 percentage points) for students in the treatment group. While this is not statistically significant, there is a statistically significant impact when using the analytical sample.
- Also, across the first semester, the likelihood of students accessing support services was 5.8% for the treatment group while it was 6.1% for the control group, a difference of 0.3 percentage points [95% CI: -2.1 to 1.4 percentage points) for students in the treatment group but this was not statistically significant.
- Due to low response rates to the student wellbeing survey, it was not possible to investigate the effect of intervention on wellbeing status.

Although the randomisation was preserved, and there are good records of who in the treatment group received the push notifications, there were three departures from the trial protocol in the way the intervention was implemented. This means the above

results may underestimate the effect of the intervention either as intended or as implemented. The IPE also provided important context to explain the above results:

- Students responded positively to the nudge content and tone, finding them motivating. They also reported it raised their awareness about existing support services.
- Some students found the app display of engagement data in Beacon confusing and unclear; this may have impacted their willingness or ability to act on the nudge. Additionally, some students also suggested they would have preferred the nudge notifications to be supplemented with an additional mode of communication, such as email, as they were seen as more personalised and likely to be read over a notification.
- Whilst the majority of staff interview participants agreed the intervention was well delivered, the IPE identified some implementation challenges due to data-handling errors, which resulted in a smaller proportion of the treatment sample receiving a second nudge than were eligible to receive it.
- Both staff and some students raised concerns about relying solely on attendance data for information on student wellbeing or academic performance. Disengagement happens for many reasons not limited to wellbeing.

## 2. Introduction

Poor mental health not only affects students' wellbeing but is also linked to a range of adverse academic and life outcomes. These include reduced educational attainment, disengagement from university, increased dropout rates, and slower progression into employment. Additionally, poor mental health poses significant risks to physical health, including increased incidences of self-harm and suicide (Newham and Francis, 2018).

In recent years there has been growing concern around student mental health and wellbeing, which has intensified following the COVID-19 pandemic. Evidence suggests that the students in higher education (HE) face heightened and multifaceted pressures with various interconnected elements at play (Jones and Bell, 2024). This has been attributed to several factors such as academic workload, isolation and loneliness, financial difficulties and the challenges of adapting to a new environment (Worsley et al., 2020). In addition, a concerning trend is also the disproportionate impact of mental health issues on specific student groups. For example, students from ethnic minority groups, care-experienced students, as well as those from low socio-economic backgrounds are more vulnerable to mental health challenges (Robertson et al., 2022).

Despite the magnitude of these issues, the proportion of HE students who access help for mental health difficulties is much lower than the expected prevalence (McLafferty et al., 2024; Newham and Foster, 2025). However, HE CMH teams are already struggling to meet increasing demand despite increases in funding (Morrish, 2023; Pollard et al., 2021). Consequently, HE institutions are in the precarious situation of needing to empower struggling (and potentially the most at-risk) students to access support while maintaining support to an increasing caseload of students (Birch et al., 2026; Clegg et al., 2026).

With the increasing use of learning analytics to improve student retention and progression, policy has encouraged HE institutions to align these systems with the mental health and wellbeing agenda to identify vulnerable students, target interventions, and provide clear pathways for accessing support (Peck et al., 2025; Department for Education, 2024). By using data for profiling and promotion of specific pathways of support, it may lead to better allocation of scarce resources such as one-to-one counselling and guided self-help, and thus alleviate pressure and service demand (Foster, 2026). Examples of universities attempting to target and personalise student mental health support on a large-scale are starting to emerge (Keane, 2024), but there remains limited published research on their effectiveness in improving outcomes. Furthermore, the translation of testing wellbeing analytics into standard practice, and the impact of introducing such data systems on the practice and roles of those in CMH teams remains unclear (Newham and Foster, 2025). A recommendation of the Higher Education Mental Health Implementation Taskforce

(2024) is to gather views from providers on their understanding of wellbeing analytics, the benefits it might bring, and the institutional changes needed to implement and leverage the benefits of wellbeing analytics.

While learning analytics holds considerable promise, there is a lack of published research evaluating its effectiveness in improving student outcomes. This study contributes to a growing evidence base on how learning analytics-based interventions can improve student engagement with their studies and wellbeing. To further build evidence, TASO commissioned KCL to evaluate the impact of a wellbeing intervention driven by learning analytics at UoS.

Instead of emails, UoS is using push notifications. UoS communicates with students through their student app, making this method more suited to the context of UoS. The “engagement nudge” intervention at UoS was developed in response to the unique challenges faced by its student population. UoS serves communities experiencing complex socio-economic disadvantage, with high levels of deprivation. A significant proportion of students are mature learners, many students have caring responsibilities and around one fifth have a registered disability.

UoS has established a clear timeline for the intervention, allowing for phased delivery. They are monitoring short-term outcomes using local authority systems and analysing which student groups are accessing support services more effectively. With this comprehensive approach, UoS aims to help students re-engage with their studies, feel supported and ultimately reduce drop-out rates.

This research builds on a growing number of existing trials including previous TASO evaluations of learning analytics prompted interventions (TASO, 2024), which aimed to increase student engagement. It also contributes to the wider international literature on student communications (see Gilani, 2025; Shaw & Gilani, 2025), digital interventions to increase student engagement and wellbeing (for example, Canning et al., 2018, Harrer et al., 2019).

The remainder of the report is structured as follows. Section 3 describes the intervention’s design, objectives, and underlying Theory of Change (ToC). Section 4 outlines the impact evaluation delivered by KCL, including the research questions and methodology. Section 5 outlines the findings from the impact evaluation. Section 6 presents the IPE by UoS, detailing how the intervention was delivered and received. Section 7 discusses the implications of the findings for policy. Section 8 outlines the roles and responsibilities of the project delivery and evaluation teams, and Section 9 summarises the ethical considerations and procedures that underpinned the study. Finally, Section 10 and 11 outline the references and appendices respectively.

### 3. Intervention description

UoS implemented the “engagement nudge” intervention designed to re-engage students who had demonstrated low levels of academic engagement. The intervention leveraged the university’s existing Beacon mobile app, which is a widely used platform that is already accessed by nearly all enrolled undergraduate students.<sup>3</sup> The app functions as both an information hub and formal attendance management system. Table 2 outlines the features of the intervention.

Table 2: Description of intervention

Section	Description
Why is the intervention being run?	Many UoS students face complex socio-economic challenges and life circumstances that can hinder engagement, requiring early, personalised support. Pro-actively signposting wellbeing and other support services to low-engaging students may prompt re-engagement and improve wellbeing.
Who is the intervention for?	Level 3 (L3) and Level 4 (L4) <sup>4</sup> first year full-time taught undergraduate students with less than 60% attendance at key periods in Semester 1 of the 2024/25 academic year.
What is the intervention?	Students in the treatment group received app-based nudges, highlighting their personalised engagement data, and signposting support services and a single point of contact for further help (see ppendix I: Attendance and engagement Beacon App tab).
Who is delivering the intervention?	The Student Engagement Team within Student and Academic Services, supported by cross-university collaboration with teams including digital services, academic quality and development, and marketing among others.

<sup>3</sup> In 2024/25, there were on average 12, 227 users per month (1 September 2024 – 31 August 2025). It is currently not possible to distinguish which app users are undergraduates or post-graduates. However, the undergraduate population use Beacon regularly to record attendance, indicating wide reach within the target population.

<sup>4</sup> L3 is equivalent to A-levels, often serving as an entry point or foundation, and L4 represents the first year of a bachelor's degree in university.

How is the intervention delivered?	Push notifications sent to students through the UoS Beacon app.
How many times will the intervention be delivered? Over how long?	The Beacon App sent push notifications up to three times (Weeks 5, 7 and 9) during Semester 1 of the 2024/25 academic year (September to December 2024) to students whose engagement dropped below the threshold.

The intervention aimed to target approximately 750 first year full-time L3 and L4 undergraduate students who, at key monitoring points during Semester 1 of the academic year, showed less than 60% attendance. Attendance was operationalised as being the average of attendance over a rolling two-week window prior to each scheduled notification. The intervention was designed to trigger before UoS's standard tiered support procedures<sup>5</sup> for disengagement, aiming to re-engage students early.

The full cohort of first year home students in either L3 or L4 courses in the university were randomly assigned to treatment and control groups. Those in the treatment group were to receive push notifications via the Beacon app in Weeks 5, 7 and 9 of the semesters if their attendance fell below the 60% threshold.<sup>6</sup>

These short, focused messages signposted students to their personalised engagement data, highlighted relevant support services and directed them to a single point of contact to help triage support needs. Services covered a wide range of areas, including mental health and wellbeing, careers and academic skills, financial support such as bursaries, fitness to study, student guidance relating to a break in studies, appeals and complaints, and the student hub (providing triage and support on broader topics impacting engagement, like technical issues and enrolment).

Students in the control group received no app-based notifications. Their access to support was per business-as-usual; they had access to the app through which they could view their engagement at their discretion. They could receive information on support services through a range of modes, including but not limited to news articles,

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<sup>5</sup> Tiered support is given to the disengaged students who dip below the engagement threshold of less than 10% and have no VLE logins

<sup>6</sup> A threshold of 60% attendance was selected to trigger the intervention, to both ensure sufficient power for the RCT and to further support the University's attendance and engagement policy, which emphasises the importance of full participation in all scheduled learning activities. Falling below this level was considered a clear marker of disengagement requiring timely support to help students re-engage and progress academically.

academic mentoring referral, and campus signage. As such, they could reach out to academic mentors or university services independently, i.e. without a nudge.

The intervention was coordinated and delivered by the Student Engagement Team within the Student and Academic Services department. It was enabled through cross-university collaboration with teams including digital services, academic quality and development, and marketing, among others.

The trial was delivered between October 2024 and December 2024. The intervention was intended to be delivered in Weeks 4, 6 and 8; ultimately the notifications were triggered in Weeks 5, 7 and 9 (on 22 October 2024, 5 November 2024 and 18 November 2024). It was intended that treatment participants received the push notification in each period they went below the threshold, so they could receive the notification up to three times. Though, in practice there was some variation in this (see Section 4.5.3). In the control group, participants did not receive an engagement nudge regardless of whether they generated a trigger during any of the three periods. They may still have received support via academic mentoring or if they self-referred to services.

As per the trial protocol<sup>7</sup>, the sample for primary analysis was restricted to those who were eligible at any point to receive the push notification i.e. students with less than 60% attendance in the two weeks prior to the scheduled nudge (according to the data provided by UoS). This analytic restriction narrows the scope of inference and shifts the value of the coefficients from reflecting the average treatment effect across the full in-scope population to a treatment effect conditional on engagement being low enough to trigger a notification.

### 3.1 Theory of Change

A ToC is a theoretical model that outlines how an intervention is expected to cause or contribute to a change in outcomes. It explains the logical sequence of the intervention, from its inputs, activities and outputs to proximate and distal outcomes and impacts. A ToC aims to articulate and illustrate the mechanisms and assumptions that explain why an intervention is believed to lead to its hypothesised outcomes.

To develop the ToC for UoS's analytics prompted email-based wellbeing intervention, KCL initially created a draft ToC based on a set of scoping activities and then led a half day online workshop with representatives from UoS to review and develop further its details (see Appendix B: Theory of change illustration

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<sup>7</sup> TASO (2024, October 29). Analytics for Wellbeing trials - University of Staffordshire. Retrieved from [osf.io/nd2hb](https://osf.io/nd2hb)

The scoping activities included performing a desk review of intervention-related documentation, which were supplemented by some initial discussions about the intervention with UoS as part of the project's inception. These activities helped to develop an initial understanding of the intervention's rationale and its expected outcomes and impacts. The workshop consisted of group discussions, where attendees outlined and reviewed the intervention's expected inputs, activities, outcomes and impacts, as well as the critical assumptions underlining the relationships between each of these factors. Following the workshop, KCL refined the ToC and shared it with the workshop participants before it was finalised.

### 3.1.1 Description of Theory of Change

A written summary of the ToC developed for UoS's intervention is provided below. An illustration developed by KCL is also included in Appendix B using TASO's core ToC template (TASO, n.d.).

**Situation:** UoS serves students from communities with complex socio-economic challenges and high levels of deprivation. Many are mature learners with caring responsibilities and around one fifth have a disability. These circumstances, combined with the transition into higher education, mean that additional, personalised support is often required. Without timely intervention, disengagement may lead to poor academic outcomes, increased drop-out risk, and worsening mental health.

**Aim:** The aim of the intervention is to re-engage students who show early signs of disengagement by sending timely, app-based push notifications. These nudges are designed to prompt students to reflect on their engagement and access the support available to them, ultimately increasing continuation and completion rates.

Inputs:

- Knowledge and time of Student Services, Academic Services, Digital Services, Business Intelligence and Management Reporting and project teams
- Beacon Student App
- Attendance and online engagement monitoring system (Dashboard)
- Student engagement strategy
- Wellbeing survey administered to students

Activities:

- Sending communications to students to download the Beacon App
- Students completing the Wellbeing Survey
- Identifying students who dip below the engagement threshold (60% attendance)
- Sending push notifications through the Beacon App to students who hit low engagement levels

- Students accessing their own academic engagement data for review and reflection
- Students accessing support services available

Outputs:

- Number of students sent push notifications
- Number of push notifications sent per student
- Number of push notifications sent in total
- Number of students accessing engagement data
- Number of students accessing support services

**Outcomes:** The outcomes are structured across short-, medium-, and long-term timeframes reflecting anticipated outcomes for the two primary stakeholders: students and UoS.

Short-term outcomes for students:

- Increased awareness of their engagement levels (attendance in degree courses)
- Increased awareness of available and accessible student support services
- Increased motivation, self-efficacy, and self-esteem

Medium-term outcomes for students:

- Increased engagement with courses
- Increased engagement with student support services
- Improved wellbeing and sense of belonging

Medium-term outcomes for UoS:

- Greater visibility of student support services and staff
- Improved institutional understanding of effective student support strategies

Long-term outcomes for students:

- Increased completion rates

Impacts:

- Increased student continuation and retention
- Improved progression into further study or employment

### 3.1.2 Anticipated causal pathways and moderating factors

The nudge intervention is anticipated to influence student behaviour into re-engaging with their studies through several causal pathways:

**Causal pathway 1:** Personalised messages/notifications about academic engagement level

Firstly, it is anticipated that the push notifications deliver immediate, tailored feedback on engagement levels to students who fall below an engagement threshold. It is assumed that receiving tailored and personal engagement levels increases the likelihood that the message would be noticed, internalised, and acted upon by students.

**Causal pathway 2:** Perceived institutional care and belonging

It is expected that the direct message from the university signals to students that someone is monitoring their progress and concerned about their wellbeing. This may foster a sense of belonging, which is particularly important for students who may feel they do not belong, or who are from marginalised backgrounds or are mature students.

**Causal pathway 3:** Increasing visibility of support services through signposting

The push notification includes links and referrals to specific student services. By clearly signposting existing support services, the intervention helps students overcome information and access barriers, which may otherwise prevent engagement with available help.

**Causal pathway 4:** Prompted self-assessment and increased motivation/ autonomy

Being alerted about how they are doing with their studies (low engagement) as well as increasing their awareness of potential support services that may help address their needs, may trigger a moment of reflection for the student. This may encourage them to evaluate their situation and take action, for example, by reaching out for help or re-engaging with academic content.

**Causal pathway 5:** Early intervention before decline in engagement increases

By intervening in Weeks 5, 7 and 9 (before formal tiered escalation occurs) the nudge seeks to address disengagement early, when recovery is more feasible, and long-term outcomes can still be positively influenced.

### 3.1.3 Discussion of moderating factors

The impact of these pathways may be affected by a number of moderating factors including:

- How the students perceive the notification related to their engagement level. For example, if students perceive the notification as intrusive or punitive (as opposed to supportive), the overall intervention may have little impact (or even a negative impact). The tone, clarity and relevance of the notification are therefore expected to play a central role in shaping students' responses.
- Students' underlying reason for low engagement and/or background/characteristics, particularly age, socio-economic background, and disability status, may shape how different groups respond to the intervention. For example, mature students or those with caring responsibilities may face structural barriers that limit their ability to respond and seek support, regardless of motivation. Similarly, UoS may be limited to address students' needs if support required is outside of what UoS can provide.
- Departmental norms and expectations around engagement may not be consistent. Some departments may have more consistent in-person attendance or clearer engagement pathways, which could shape how students perceive and act on the notification.
- UoS student support services have capacity to respond to increased demand. If students are motivated to seek help but face long waits or unclear pathways, the positive effects of the nudge could be diminished.

## 4. Impact evaluation

A key goal of the evaluation was to identify and measure the impacts of the analytics-driven wellbeing intervention, delivered through a push notification prompt, if any exist. This was assessed through an RCT.

### 4.1 Research questions

The research questions for the impact evaluation were:

- 1) To what extent does the "engagement nudge" intervention increase re-engagement with education among students who drop below the 60% engagement threshold?
- 2) To what extent does the "engagement nudge" intervention affect engagement with support services among students who drop below the 60% engagement threshold?
- 3) To what extent does the "engagement nudge" intervention increase wellbeing among students who drop below the 60% engagement threshold?

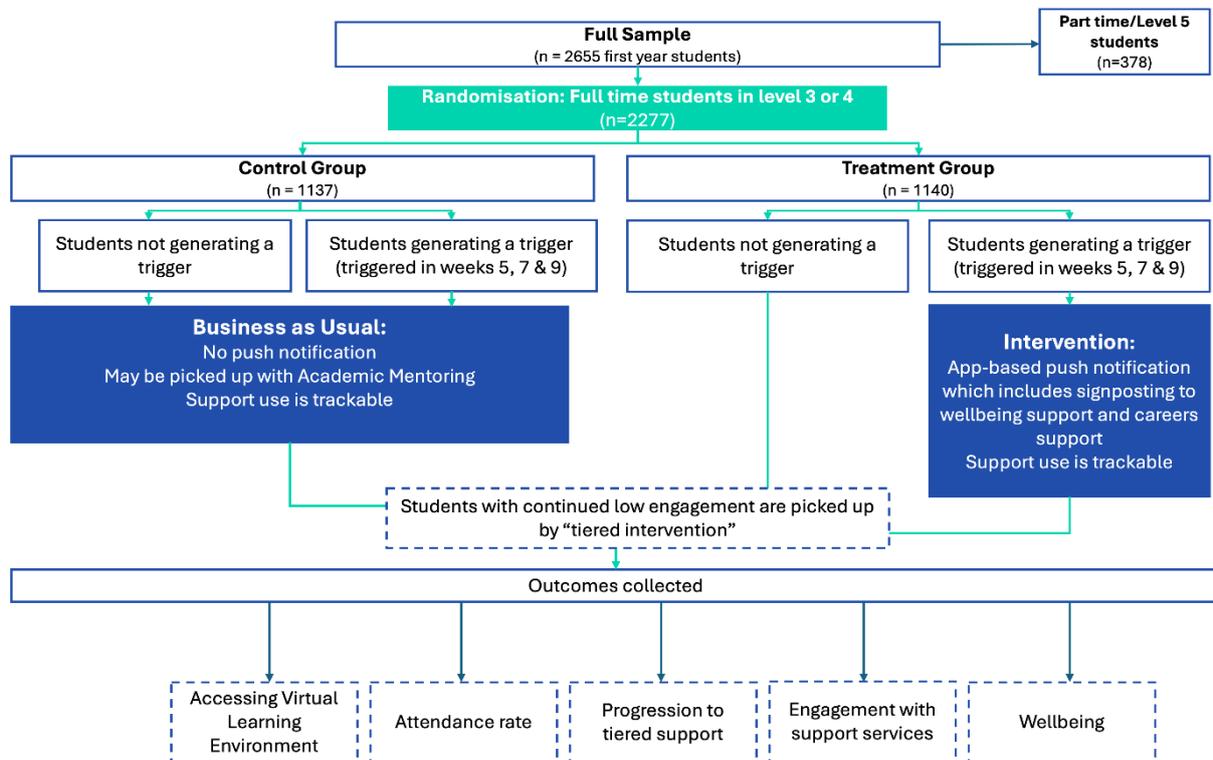
- 4) To what extent is the “engagement nudge” intervention effective for different groups of students?
- (Exploratory) Ethnicity.
  - (Exploratory) Mature student status.
  - (Exploratory) Socioeconomic background.
  - (Exploratory) Department.

## 4.2 Impact evaluation design

### 4.2.1 Design

The impact evaluation was run as a two-arm RCT with individual-level randomisation, to test the impact of the “engagement nudge” intervention on students’ re-engagement with their course and with UoS. Figure 1 below provides an overview of the trial design.

Figure 1: CONSORT flow diagram of RCT



### 4.2.2 Sample selection

The sample comprised 2,277 first year full-time home students drawn from twelve departments who were either in L3 or L4 courses in the university – the overall sample.

Departments involved in the trial were drawn from two schools, each consisting of six departments within UoS:

School of Digital, Technology, Innovation and Business (DTIB)

- Computing and Esports (COE)
- Creative Industries (CRI)
- Engineering (ENG)
- Staffordshire Games Institute (GMI)
- Institute of Business and Innovation (IBI)
- University of Staffordshire London (SUL)

Health, Education, Policing and Sciences (HEPS)

- Allied Health (ALH)
- Institute of Education (IOE)
- Nursing and Midwifery (NUM)
- Psychology (PSY)
- Sport and Sciences (SAS)
- Social Work, Law and Criminology (SLC)

### 4.2.3 Randomisation

Students were randomised at the individual level, stratified by department.

Randomisation was conducted by UoS using R code written by KCL (see Appendix D: Code for randomisation / analysis). KCL and UoS worked closely to test the code, which also provided cross-tabulations of the treatment and control groups for balance checks. All in-scope first year students were randomised.

It was discussed whether to randomise participants at the point they met the low-engagement threshold instead of at the beginning of the semester, as this would yield higher confidence of those students being balanced across treatment and control. However, due to the practical constraints and complexity of randomising at multiple points on very short turnaround, with concomitant risk of manual handling error, it was decided that the most appropriate approach was to randomise all students. The assumption was that randomising the sample with stratification would be sufficient to deliver a balanced set of students who met the low-engagement threshold to treatment and control.

Participants were randomised into one of two trial arms:

- The treatment group received an app-based notification to access support with trackable links to support services.
- The control group received business-as-usual support.

Through the randomisation, 1140 students were assigned to the treatment group and 1137 were allocated to the control group. Out of the 1,140 students in the treatment

group, 327 students fell below the 60% engagement threshold and received the app-based push notification. Meanwhile, the control group, including those who fell below the threshold ( $n=333$ ) received no app-based push notification but were able to access support through Academic Mentoring reflecting business-as-usual communication.

Ultimately, 660 (28.9%) students fell below the threshold at least once: this latter group forms the **analytical sample** for our primary analysis.

Researchers at KCL and UoS were not blinded to treatment allocation. This was not practically possible as UoS researchers needed to know the allocation to deliver the intervention. Moreover, for the purpose of the analysis, blinding was not considered necessary. The independence of the KCL analysts from the intervention development and delivery, as well as the pre-registration of the analytical strategy, were considered sufficient safeguards against motivated intervention in the study analysis or reporting.

Students were not actively informed of their allocation status, but they were also not blinded to it as their receipt of a push notification was related to their treatment assignment.

## 4.3 Data

### 4.3.1 Outcome variables

Table 3 outlines the outcome measures (the metric to capture the outcome) alongside the data type, the data source and point of collection. The variables were chosen in collaboration with UoS and represent how the university conceptualises student engagement.

Table 3: Outcome measures

Outcome measure	Data to be collected (Data type)	Data source	Point of collection
<b>PRIMARY:</b> Academic Engagement (VLE accessed)	Number of times logged in to Blackboard in the two weeks following push notification (Continuous)	Blackboard	December 2024
<b>PRIMARY:</b> Academic Engagement (timetabled events)	Attendance (%) in timetabled session in the two weeks following push notification (Continuous)	Attendance and online engagement monitoring system	December 2024
<b>SECONDARY:</b> Progression to tiered support	Whether tiered support communications are triggered at all over the course of Semester 1 (Binary)	Academic mentoring system	December 2024

Outcome measure	Data to be collected (Data type)	Data source	Point of collection
<b>SECONDARY:</b> Engagement with support services	Whether student attends an appointment with Support Services in Semester 1 (Binary)	Appointment has been booked and attendance registered in student services record system	December 2024
<b>EXPLORATORY:</b> Wellbeing	GP-CORE, 14-item assessment (scale 1-5) measuring wellbeing outcomes identified as important for students and used in non-clinical populations. Mean score (Continuous)	UoS hosted Qualtrics account	December 2024

### 4.3.2 Other variables

Table 4 describes the key covariates that were included in the main analysis.

Table 4: Covariates to be included in primary analytical specification

Data Point	Purpose	Data to be collected	Data source	Point of collection
Gender	Gender and ethnicity are considered key covariates that predict the outcome variables.	Gender	UoS management information	Enrolment
Ethnicity		Ethnicity (high-level) <sup>8</sup>	UoS management information	
Disability	Disability is considered a covariate that predicts the	Whether disability has been declared- Yes/No	UoS management information	

<sup>8</sup> As classified by the ONS, high-level ethnic groups are Asian, Asian British, Asian Welsh; Black, Black British, Black Welsh, Caribbean or African; Mixed or Multiple; White; and Another ethnic group.

Data Point	Purpose	Data to be collected	Data source	Point of collection
	outcome variables.			
Department	Department is the stratification variable.	Department of course of study	UoS management information	
Past attendance at timetabled sessions (engagement)	Past engagement score is likely to be highly predictive of future engagement.	Percentage of timetabled sessions attended	Attendance and online engagement monitoring system	Pre-treatment

Table 5 lists the covariates that were collected to investigate whether they contributed explanatory power or influenced the treatment effect. We also used these covariates in heterogeneity analysis to explore if there were differential impacts of the intervention on the subgroups.

Table 5: Other demographics to be collected

Data Point	Purpose	Data to be collected	Data source	Point of collection
Mature student status	Conducting subgroup analysis on whether treatment effect varies by age	Mature student (yes/no)	UoS management information	Enrolment
Socio-economic background	Conducting subgroup analysis on whether treatment effect varies by socio-	Index of Multiple Deprivation (IMD) quintile of home postcode		

Data Point	Purpose	Data to be collected	Data source	Point of collection
	economic background			

### 4.3.3 Data collection methods

Data was collected by UoS via their management information systems. The wellbeing survey was distributed by UoS to all randomised students. The survey was hosted on a UoS Qualtrics account. Data on outcomes and covariates listed in Section 4.3.2 were provided by UoS to KCL for analysis.

### 4.3.4 Data cleaning and preparation

UoS provided data to KCL’s evaluation team via extracts from various student records systems. In most cases these were identified by student number, while data from the Beacon app used a user ID. UoS pseudonymised both the student numbers and the user IDs, and provided a key to link the pseudonymised student numbers and user IDs.<sup>9</sup> Matching of individuals across the datasets was done using these identification fields, with the spreadsheet that had the allocation and demographic data serving as the ‘spine’ (see Appendix C, Table 28 for a summary of the datasets that were provided and the number of cases matched into the allocation spreadsheet).

We worked with UoS to investigate the underlying causes of the inability to link records across datasets, aiming to improve the overall match rates. Through this exploration exercise, two causes were found:

- 1) 378 students (14.2%, with 188 in treatment and 190 in control group) who were out of scope for the trial were nevertheless randomised, and their outcomes data were therefore not collected. These set of students were removed from the randomised dataset. This theoretically introduced a risk of imbalance between treatment and control groups. However, our balance checks confirm that no such imbalance occurred (Table 8).
- 2) Student IDs in the spreadsheets containing outcomes data (Table 3) could not be matched to the spreadsheet that contained treatment allocation status. For instance, we received 108 wellbeing survey responses from students who were not randomised. Similarly, 26 students were not a part of the allocation spreadsheet but received the nudge notification. Additionally, there were 61

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<sup>9</sup> We did not have access to any personal data of students, including their student IDs, as this was a requirement of UoS’s Ethics approval.

students who were not part of the allocation spreadsheet and thus not in-scope of the trial, however, they still appeared in the “tiered support” dataset which was shared in a separate spreadsheet. While this may simply reflect UoS providing a dataset which included both in-scope and out-of-scope students, it also introduces the possibility of an error in the pseudonymisation process – specifically that some students who should have matched did not. As the evaluation team does not have access to personal identifiers, it was not possible to independently verify the pseudonymisation consistency. As a result of this potential matching issue, there is a risk that outcome levels may be slightly underestimated if students who did complete an outcome (e.g. signed up for a support appointment) could not be matched to their treatment allocation and were consequently coded as not having completed it. This would be expected to deflate outcome levels in both treatment and control groups by introducing false negatives. However, we have no reason to expect any differential impact between the two groups, as any pseudonymisation errors would be independent of intervention status.

It is important to note that the primary outcomes were both successfully matched to a treatment allocation with fewer than 1% of cases missing data for Blackboard logins. Therefore, overall, our data is substantively complete for the primary analysis. Likewise, all instances of a notification being triggered were matched to an allocation. The full description of the match rates is included in Appendix C.

## 4.4 Analytical strategy

### 4.4.1 Descriptive analysis

The descriptive analysis has been presented to provide an overview of the key variables across the full in-scope sample, as well as separately for the treatment and control groups and any relevant sub-groups.

We explore distributions of key socio-demographic characteristics across the subgroups and by treatment allocation. This includes gender, ethnicity, mature student status, IMD quintile, study year, disability status and school of study.

The potential sources of heterogeneity in pre-intervention attendance rates in timetabled classes (primary outcome) arising from demographic (gender and ethnicity) and socio-economic characteristics (reflected by IMD quintile) are presented. This analysis is exploratory in nature and its purpose is to provide initial insights into which subgroups may be driving the overall treatment effect.

#### 4.4.2 Balance Checks

We conducted balance checks to investigate whether the key demographic covariates we collected from students were balanced across treatment and control groups. The following rules were used to conclude if a covariate was imbalanced in terms of its distribution across the treatment and control group:

- For continuous variables: the absolute difference in the means between the two groups, as a proportion of the sample standard deviation (equivalent to a Z-score within a Standard Normal Distribution), exceeded 0.1.
- For categorical variables: a difference of more than a five percentage points in the proportions of respondents in each category.

#### 4.4.3 Primary analysis

Analysis was conducted in R using ordinary least squares (OLS) regression with robust standard errors with the following specification:

$$Y_i = \alpha + \beta_1 D_i + \beta_{2:n} \mathbf{X}_i + \epsilon_i$$

Where:

- $Y_i$  is individual  $i$ 's level of a given outcome, as outlined in Section 4.3.1.
- $D_i$  refers to individual  $i$ 's treatment allocation, set to 1 if they are allocated to treatment and 0 otherwise.
- $\mathbf{X}_i$  is a vector of pre-treatment covariates as outlined in Section 4.3.2.

Where pre-treatment levels of the outcome were available, an additional term,  $Y_{0i}$ , was included in the model to capture the baseline level.

#### 4.4.4 Secondary analysis

Analysis was conducted using the full in-scope sample to assess the effect of the intervention on all the primary and secondary outcomes, following the specification above.

As will be discussed further in Section 4.5, given deviations from the protocol that occurred in delivery of the notifications, it is our view that this analysis may provide a more secure insight into the potential treatment effect.

#### 4.4.5 Multiple comparisons

The analysis includes multiple comparisons, as models are estimated both for multiple dependent variables, and to test for significant treatment effects across different sample sub-groups. Based on the number of comparisons (outcomes x treatment

arms) being made (Sanders et al., 2025), adjustments for multiple comparisons were not conducted.

#### 4.4.6 Missing data and imputations

Missingness on pre-treatment covariates (including baseline outcomes) are assumed to be Missing Completely at Random as these are independent of treatment assignment. As specified in the protocol, since missingness on any given covariate was less than 5%, complete case analysis was used.

Consistent with our expectation, attrition for outcomes collected via UoS management information was close to zero as all student records systems are linked using the same student ID. As noted in Section 4.3.4, there were unmatched cases in some of the outcome data spreadsheets; these were not treated as missing data since they were linked to pseudonymous student IDs not in the allocation record. Analysis was therefore conducted on complete cases.

Missingness on student wellbeing (exploratory) was substantively high (~96%). With more than 50% of observations missing, and no suitable auxiliary information available, no imputation analysis was conducted.

#### 4.4.7 Robustness tests

The primary specification (see Section 4.4.3) was rerun including and excluding covariates. The main model used gender, ethnicity, disability and past attendance. Models for robustness checks included the following in addition: mature student status and IMD quintile, including running a model excluding all covariates. As two of the outcomes of interest are binary, we also reran the primary analysis specification using a binary logistic (logit) estimator.

#### 4.4.8 Heterogeneity analysis

UoS is interested in whether treatment effectiveness varies by demographics, particularly ethnicity, mature student status, socio-economic background and academic department. The analysis specified in Section 4.4.3 was re-run to include an interaction term between the treatment and categorical moderator variable.

These four subgroups were selected for analysis because they represent key demographic and contextual factors that were expected to potentially influence the intervention's effectiveness, based on discussions with UoS. For instance, departments play a central role in shaping students' academic environment, culture, access to resources, and opportunities. Examining differences across departments would help to identify whether institutional factors may play a mediating effect on the intervention's effects. Ethnicity has been found to influence the cultural compatibility students had within an academic environment (Meeuwisse et al., 2010). This may

impact the degree of engagement they have and thus how they may respond to the intervention. Finally checking impact by mature student status can be crucial for understanding whether age differences that shape life circumstances and priorities can have a moderating impact on the way the intervention interacts with engagement level.

#### 4.4.9 Exploratory analysis

As part of the exploratory analysis, we estimated the following:

1. **The effect of the intervention on wellbeing status:** we conducted OLS regressions, following the specification in Section 4.4.3.
2. Any differential effects of the intervention depending on when the students first fell below the 60% attendance threshold (that is, whether they trigger the notification in Week 5, 7 or 9): a series of separate regressions were run comparing outcomes for control participants and treatment participants who triggered notifications in Week 5, Week 7, or Week 9, respectively.

### 4.5 Deviations from study protocol

Three deviations from the pre-registered protocol occurred during the implementation phase of the study. These are outlined below, along with their implications.

#### 4.5.1 Inclusion of part-time students in randomisation

Following the protocol, full-time first year home students at UoS from twelve departments were in scope to be randomised for the trial. However, 378 students were part of the randomisation but ineligible to participate in the study because they were either in a part-time course or in another year of study.

There was a concern that the inclusion of this subgroup in the randomisation might have compromised the internal balance of the trial. Balance checks on the in-scope sample (excluding those who were not eligible for the trial) showed no significant differences between the treatment and control groups (Appendix E). On this basis, we proceeded with the analysis, excluding the ineligible students.

#### 4.5.2 Deviations from the attendance threshold for notifications

The trial protocol stipulated that students in the treatment group with attendance below 50% in the two weeks prior to the intervention would receive a push notification. It was agreed subsequently that UoS would use a 60% threshold instead, which has been applied in this analysis. This decision was made to ensure sufficient power for the RCT and in keeping with the UoS's attendance and engagement policy which states:

'The University recognises that to be successful with their academic studies students need to fully engage with the teaching and learning offered as part of their chosen award/programme. Attendance therefore at all formal teaching activity is expected.'

At the same time, using the data provided, we were unable to reproduce the results based on the rule specified in the protocol for constructing the analytical sample within either the treatment or control group. Given that the number of classes scheduled for each week differed, but UoS only supplied *weekly attendance percentages*, it was not possible to calculate the bi-weekly weighted attendance rate. To calculate the attendance rate across a two-week period would have required the underlying raw data, specifically the *number of classes attended* and the *total number of classes scheduled*, but this level of detail could not be obtained in the analysis phase of the trial.

Instead, UoS separately provided a list of students classified as having attendance below the 60% threshold, and this list has been used as the analytical sample for the primary analysis.<sup>10</sup> The final sample size was agreed after multiple exchanges with UoS, prompted by the presence of out-of-scope students and differences in how UoS applied the decision rule. Because the underlying attendance data were not available to us, we could not independently validate the reasons for these discrepancies.

The absence of absolute figures for attendance necessitated two deviations from the protocol, described below:

**Pre-intervention attendance indicator:** We have computed the pre-intervention attendance variable by using the attendance rate from the week immediately preceding the intervention (before 21 October 2024). If this value was missing, we used the attendance rate from two weeks prior (14 October 2024). This approach maximised the available data.

**Post-intervention attendance indicator:** The trial protocol specified the attendance, in timetabled classes, would be defined as the number of times a student attended timetabled sessions in the two weeks following the push notification. However, as noted previously, we were only able to access attendance as percentages for each week. Since, total number of classes differed by week, it was not possible to calculate a

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<sup>10</sup> There were six students (~0.9% of the analytical sample) whose eligibility is contested since they were considered in-scope in one dataset and out-of-scope in another. We have, therefore, excluded them from the analysis. We also found 79 students who were previously not present in the dataset shared by UoS but were later included. The reason stated by UoS was that there was a discrepancy between the decision-rule used by them in the current dataset and the decision-rule that was applied to the older dataset. Since this forms a considerable proportion of the sample (~12%), we ran the primary analysis including and excluding these students and found that the estimates are consistent.

mean attendance across the two weeks following each intervention point (i.e. 22 October 2024 and 25 November 2024). To address this data limitation point, we have instead used the attendance rate from the second week following the last nudge notification, or, if missing, from the first week after the last nudge notification.

Notwithstanding this, UoS provided absolute attendance numbers for the subset of students who triggered the notification. To maintain consistency in model estimation, we have used these pre- and post-intervention attendance indicators as described. Overall, robustness checks used alternative operationalisations of post-intervention attendance rates and the results indicated that these modifications did not alter the results. This validates the consistency of the findings. These are presented in Appendix F.

### 4.5.3 Non-delivery of push notification two to students who triggered for the first time in period two

UoS reported that the intervention was inadvertently not delivered to students in the treatment group who triggered for the first time in period two. This impacted 158 students (14% of the treated sample). However, the intervention in period two was delivered as intended to those who had triggered a notification in both period one and two.

Table 6 summarises the discussion above via a matrix.

Table 6: Deviation in intervention delivery

	Triggered in period one	Did not trigger in period one
Triggered in period two	Received treatment in period two	Did not receive treatment in period two
Did not trigger in period two	Received treatment in period one	Did not receive treatment in either period
Key- Green: no deviation occurred Red: deviation occurred		

It is also possible that students who should have triggered the notification for the first time in period two but did not receive the notification did not have a notification triggered again in period three. Therefore, some eligible students may have **never**

received the treatment in the trial period, despite being eligible. This has been illustrated below in Table 7.

Table 7: Undertreatment in the trial due to deviation in intervention delivery

	<b>Triggered in period two for the first time</b>	<b>Triggered in period two for the second time</b>
<b>Triggered in period three</b>	Received treatment in the trial period (one time)	Received treatment in the trial period (three times)
<b>Did not trigger in period three</b>	Never received treatment	Received treatment in the trial period (two times)
Key-		
Green: treatment received as intended		
Red: no treatment received		
Orange: undertreatment occurred		

From an analytical standpoint, this limitation does not threaten the overall validity of the trial, but it is important to acknowledge it as a modification of the treatment that has potential impacts on the estimated treatment effect. As this also affects compliance, it is captured as part of the compliance analysis in Table 44: Exploratory analysis assessing whether there are differential effects of the timing of when the students generated the low engagement trigger on VLE logins

	Model 1	Model 2	Model 3
(Intercept)	3.22 [ 1.96; 4.48 ]*	5.50 [ 3.08; 7.92 ]*	4.37 [ 1.55; 7.19 ]*
Treatment	0.19 [-0.90; 1.29]	0.03 [-1.37; 1.44]	0.19 [-0.79; 1.17]
Female	0.62 [-0.46; 1.69]	0.81 [-0.62; 2.24]	0.93 [-0.14; 1.99]
Disabled=Yes	0.83 [-0.35; 2.02]	-0.57 [-1.96; 0.81]	-0.34 [-1.55; 0.86]
Mean Attendance	0.03 [ 0.01; 0.05 ]*	-0.01 [-0.04; 0.02]	0.01 [-0.02; 0.04]
R <sup>2</sup>	0.05	0.01	0.02
Adj. R <sup>2</sup>	0.04	-0.02	0.00
Num. obs.	264	136	252
RMSE	4.50	4.18	3.94

\*\*\*  $p < 0.001$ ; \*\*  $p < 0.01$ ; \*  $p < 0.05$ ; +  $p < 0.1$ . 95% confidence intervals provided in the brackets. Models compare treatment group to control group. Covariates include gender, disability status, ethnicity and mean attendance.

Table 45: Exploratory analysis assessing whether there are differential effects of the timing of when the students generated the low engagement trigger on attendance

	Model 1	Model 2	Model 3
(Intercept)	31.86 [ 22.06; 41.66] *	77.91 [ 58.32; 97.50] *	44.67 [ 23.29; 66.05] *
Treatment	3.98 [ -4.69; 12.65]	-7.49 [ -18.66; 3.68]	3.36 [ -4.80; 11.53]
Female	7.58 [ -1.21; 16.37]	-4.68 [ -15.86; 6.50]	10.34 [ 1.93; 18.74] *
Disabled=Yes	-7.19 [ -16.31; 1.93]	5.93 [ -5.93; 17.80]	-11.90 [ -21.80; -2.00] *
Mean Attendance	0.25 [ 0.08; 0.42] *	-0.30 [ -0.55; -0.05] *	0.16 [ -0.08; 0.40]
R <sup>2</sup>	0.06	0.07	0.06
Adj. R <sup>2</sup>	0.05	0.04	0.04
Num. obs.	272	136	252
RMSE	36.16	33.43	32.67

\*\*\*  $p < 0.001$ ; \*\*  $p < 0.01$ ; \*  $p < 0.05$ ; +  $p < 0.1$ . 95% confidence intervals provided in the brackets. Models compare treatment group to control group. Covariates include gender, disability status, ethnicity and mean attendance.

## 5. Results

### 5.1 Descriptive statistics

The demographic characteristics of the in-scope sample (defined as the randomised sample who were eligible for the trial) and the analytical sample (comprising the subset of the in-scope sample who triggered a notification at least once) are presented in Table 29 and Table 30 in Appendix E: Description of baseline sample and pre/post trends.

Within the in-scope sample, 72.2% of the students were below 21 years old at the start of their course. The proportion of below 21 year-olds between the treatment (73.6%) and control groups (70.9%) are similar. The majority of students are white (64.9%) while 9.1% of the sample are Black and 11.6% are Asian. 14.3% of the students reported their ethnicity as other than white, Black, or Asian, or did not share their ethnicity status. Ethnicity is also balanced between the treatment and control groups across the different ethnicity categories. For instance, 65.1% are white in the treatment group and 64.7% are white in the control group. The gender distribution is also balanced across groups, though females slightly outnumber males, constituting 51.4% of the sample. Students from IMD quintile 5 (the least deprived) are underrepresented in the sample (14.7%) while 31.1% are from quintile 1. IMD quintile distribution (quintile 5) is well-balanced between treatment (15.2%) and control groups (14.2%). Finally, 27% of the sample reported having a disability and the distribution of disabled students between the control (27.4%) and treatment (26.1%) groups is similar.

It is interesting to note that those in the analytical sample (i.e. those who fall below the engagement threshold) follow a similar distribution as those in the in-scope sample.

### 5.2 Balance checks

Balance was checked on the following covariates: ethnicity, gender, mature student status, and disability status. We do this for the in-scope dataset and the analytical dataset, presented in Table 8 and Table 9.

Table 8: Balance checks of key demographic characteristics of in-scope sample

Variable	Control (%)	Treatment (%)	Difference
Ethnicity: White	64.73	65.09	0.36
Gender: Male	47.67	49.56	1.89
Mature: No	70.89	73.60	2.71

Variable	Control (%)	Treatment (%)	Difference
Disabled: No	72.56	73.95	1.39
IMD: Q5	14.18	15.22	1.04

Table 9: Balance checks of key demographic characteristics of analytical sample

Variable	Control (%)	Treatment (%)	Difference
Ethnicity: White	61.86	62.08	0.22
Gender: Male	51.65	50.46	1.19
Mature: No	72.07	74.31	2.24
Disabled: No	67.57	67.58	0.01
IMD: Q5	12.06	12.83	0.77

The above tables show that there are no significant differences between the groups across any of the variables.

Balance checks were also used to ascertain whether proceeding with an intention to treat (ITT) analysis would be more relevant in lieu of the discrepancy in the randomised sample and the cohort that received the intervention, as discussed in 4.5.1. Given there are no differences between the groups across all demographic characteristics (other than gender) that exceed the established tolerance threshold, analysis was carried out as specified in the protocol.

### 5.3 Results of impact analysis

In this section, we present the estimates of the impact of the treatment on each of the outcome measures. We use the OLS model with four covariates (gender, ethnicity, disability status, and pre-intervention attendance) for conducting the primary analysis, as specified in Section 4.4.3.

The primary analysis was run on the dataset that comprised all students whose attendance in timetabled sessions fell below 60% at least once in the trial period (analytical sample), as per the trial protocol. At the same time, given the deviations from the trial protocol in the context of issues around intervention delivery, differences in the way the threshold for triggering a disengagement alert was defined, and the challenges around defining an appropriate value for attendance (see Section 4.5), we consider the in-scope sample (all students who were part of the randomisation) may be the more appropriate analytical population. Accordingly, regression results for the primary outcomes based on the in-scope sample are presented alongside findings for the analytical sample; this sample was specified as secondary analysis in the protocol.

The following models are presented in Appendix F as a robustness check alongside the results from the main specification: OLS model with seven covariates (IMD quintile, department, and mature student status, in addition to the four covariates used in the main model); OLS model with no covariates; and binary logistic model with four covariates used in the main model (if outcome variable is binary).

Table 10: Results of primary analysis (analytical sample)

	Primary Outcome		Secondary outcome	
	Blackboard logins	Attendance rate	Tiered Support	Access to support services
(Intercept)	4.27 [3.35; 5.19]*	43.44 [ 35.10; 51.78]*	0.14 [ 0.07; 0.22]*	0.05 [0.00; 0.09]*
Treatment	0.16 [-0.49; 0.81]	1.76 [-3.61; 7.14]	0.05 [0.01; 0.09]*	-0.01 [-0.03; 0.00]
Effect Size (Cohen's d)	0.04	0.02	0.17	-0.13
Disabled=Yes (ref: Disability=No)	0.20 [-0.53; 0.93]	-5.01 [-11.04; 1.01]	0.02 [-0.03; 0.07]	0.0004 [-0.0178; 0.0267]
Ethnicity=Black (ref: Ethnicity=White)	0.81 [-0.50; 2.13]	0.64 [-9.65; 10.94]	0.04 [-0.05; 0.13]	-0.02 [-0.03; -0.00]*
Ethnicity=Asian (ref: Ethnicity=White)	0.28 [-0.61; 1.17]	1.48 [-6.05; 9.01]	0.03 [-0.04; 0.09]	0.01 [-0.03; 0.04]
Ethnicity=Other (ref: Ethnicity=White)	0.90 [-0.11; 1.91]	-5.10 [-12.84; 2.65]	-0.02 [-0.08; 0.03]	-0.02 [-0.03; -0.01]*
Baseline Attendance	0.02 [0.01; 0.03]*	0.23 [0.14; 0.31]*	-0.0018 [-0.0026; -0.0010]*	-0.0004 [-0.0008; -0.0001]*
R <sup>2</sup>	0.04	0.06	0.06	0.02
Adj. R <sup>2</sup>	0.03	0.05	0.05	0.01
Num. obs.	652	660	660	660
RMSE	4.22	34.99	0.27	0.12

\*\*\* p < 0.001; \*\* p < 0.01; \* p < 0.05. 95% confidence intervals provided in brackets.

Table 11: Results of primary analysis (in-scope sample)

	Primary Outcome		Secondary Outcome	
	Blackboard logins	Attendance rate	Tiered Support	Access to support services
(Intercept)	3.25 [2.54; 3.96]*	38.24 [32.87; 43.61]*	0.16 [0.11; 0.21]*	0.08 [0.04; 0.12]*
Treatment	0.34 [-0.09; 0.77]	0.78 [-1.59; 3.16]	0.01 [-0.00; 0.02]	-0.003 [-0.021; 0.014]
Effect Size (Cohen's d)	0.06	0.06	0.07	-0.01
Disabled=Yes (ref: Disability=No)	0.35 [-0.15; 0.86]	-4.26 [-7.10; -1.42]*	0.01 [-0.01; 0.02]	0.02 [0.00; 0.04]*
Ethnicity=Black (ref: Ethnicity=White)	0.54 [-0.17; 1.25]	2.20 [-1.82; 6.21]	0.01 [-0.01; 0.03]	0.04 [0.00; 0.08]*
Ethnicity=Asian (ref: Ethnicity=White)	0.53 [-0.19; 1.25]	-3.92 [-7.81; -0.02]*	0.02 [-0.01; 0.04]	0.02 [-0.01; 0.05]
Ethnicity=Other (ref: Ethnicity=White)	0.60 [-0.04; 1.25]	-4.61 [-8.33; -0.89]*	-0.01 [-0.03; 0.01]	0.03 [0.00; 0.06]*
Baseline Attendance	0.05 [0.05; 0.06]*	0.48 [0.43; 0.53]*	-0.00 [-0.00; -0.00]*	-0.0005 [-0.0009; -0.0000] *
R <sup>2</sup>	0.07	0.19	0.09	0.01
Adj. R <sup>2</sup>	0.07	0.19	0.09	0.01
Num. obs.	2263	2277	2277	2277
RMSE	5.26	28.81	0.15	0.22

\*\*\* p < 0.001; \*\* p < 0.01; \* p < 0.05. 95% confidence intervals provided in brackets.

### 5.3.1 Impact of the intervention on blackboard logins

There was no significant impact of the intervention on blackboard logins for either the analytical sample or the in-scope sample (Table 10 and Table 11 column 2, row 2).

### 5.3.2 Impact of the intervention on attendance rate

There was no significant impact of the intervention on attendance for either the analytical sample or the in-scope sample (Table 10 and Table 11, column 3, row 2).

### 5.3.3 Results of secondary outcome analysis

Progression to tiered support

Table 10, column 4 indicates that students in the treatment group are more likely (by five percentage points) to progress to tiered support than those in the control group. The results are statistically significant for the analytical sample (Table 10 column 4, row 2) but not for the in-scope sample (Table 11 column 4, row 2).

Engagement with support services

There was no significant impact of the intervention on engaging with support services for either the analytical sample or the in-scope sample (Table 10 and Table 11, column 5, row 2).

### 5.3.4 Results of robustness tests

As outlined in Section 4.4.7, robustness checks were conducted to verify the reliability of the main findings. Across all the specifications, the direction, magnitude, and statistical significance of the estimated treatment effects remained consistent. Detailed estimates and specifications are presented in Appendix F. These results support the credibility of our main findings.

### 5.3.5 Results of heterogeneity analysis

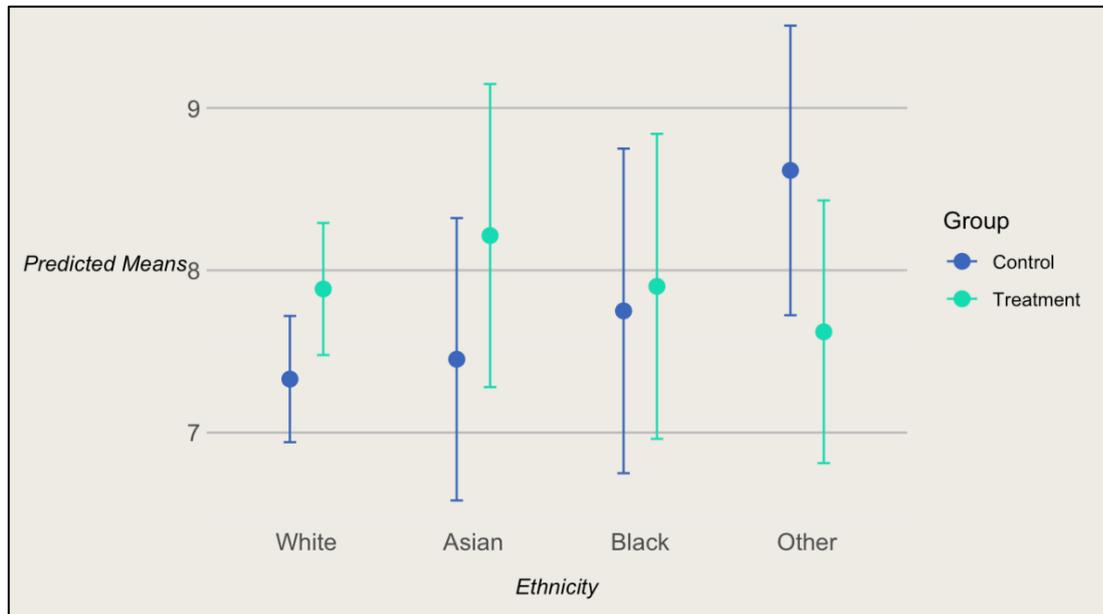
This subsection presents the results of the subgroup analysis conducted across age (mature status), ethnicity, and department.

Heterogeneity analyses were conducted using the in-scope sample rather than the analytical sample, as the latter's smaller size would have resulted in insufficiently powered subgroup estimates. Subgroup analysis for department indicates no statistically significant effects of the intervention on the primary outcomes (number of blackboard logins and attendance). However, there are some differences in effects by ethnicity (Figure 2), IMD quintile (Figure 3) and age (Figure 4).

On Blackboard login numbers, we observe a negative and statistically significant coefficient for students under the "other" category in ethnicity. Relative to white students in the treatment group, the students categorised under the "other" category have, on average, 1.55 fewer logins [CI: -2.81, -0.29], significant at the 5% threshold. However, it must be noted that the confidence interval lies mostly close to zero and the magnitude of the difference is relatively modest. To illustrate the direction and

magnitude of subgroup differences across ethnicities, we examined how post-treatment average blackboard logins vary between the treatment and control group across the various ethnicity categories in Figure 2.

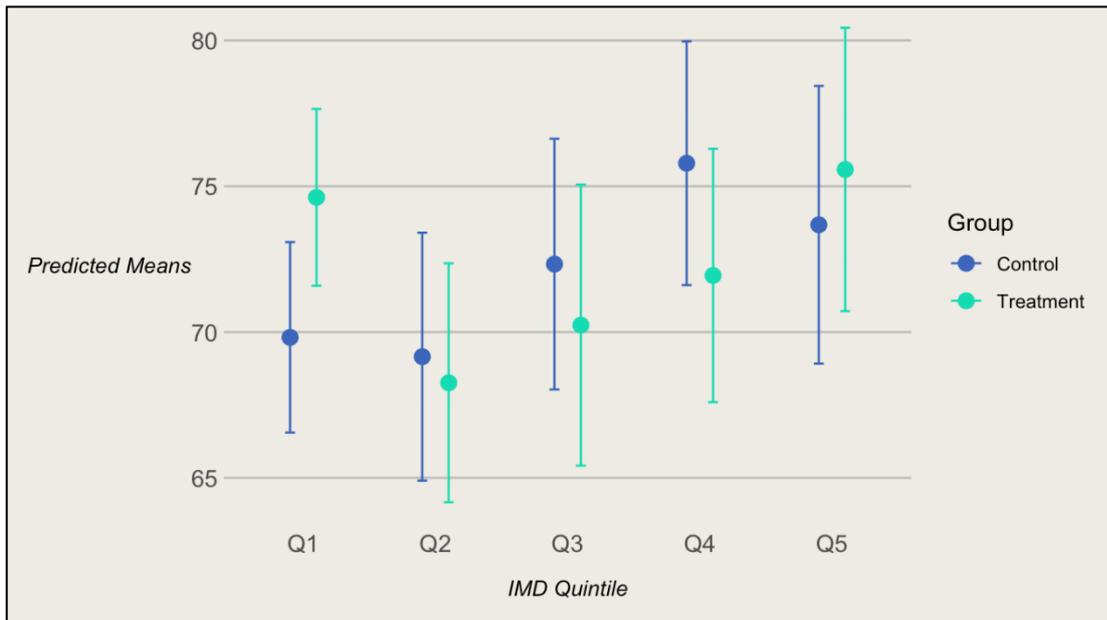
Figure 2: Blackboard logins across ethnicities



On attendance, there is a negative and statistically significant coefficient for students in IMD Q4. Relative to students in IMD Q1 within the treatment group, students in IMD Q4 have an attendance rate that is 8.65 percentage points lower, significant at the 5% threshold. The negative effect in this subgroup is consistent across the confidence interval, ranging from -15.38 to -1.92. This suggests that IMD Q4 shows a more negative effect compared with IMD Q1, though the effect size could vary substantially within this range, making the exact magnitude of difference uncertain.

Figure 3 illustrates how post-treatment average attendance varies between the treatment and control group across the various IMD quintiles.

Figure 3: Attendance across IMD Quintiles



Additionally, students older than 21 (mature students) have an attendance rate that is 6.02 percentage points higher compared to students under 21 in the treatment group [CI: 0.92, 11.12] at the 5% significance level. However, the wide confidence interval highlights uncertainty in the exact magnitude of the effect, and the lower bound being close to zero indicates that the true difference could be relatively small. Figure 4 illustrates how post-treatment average attendance varies between the treatment and control group between students below 21 and above 21 years of age.

Figure 4: Attendance across mature student status

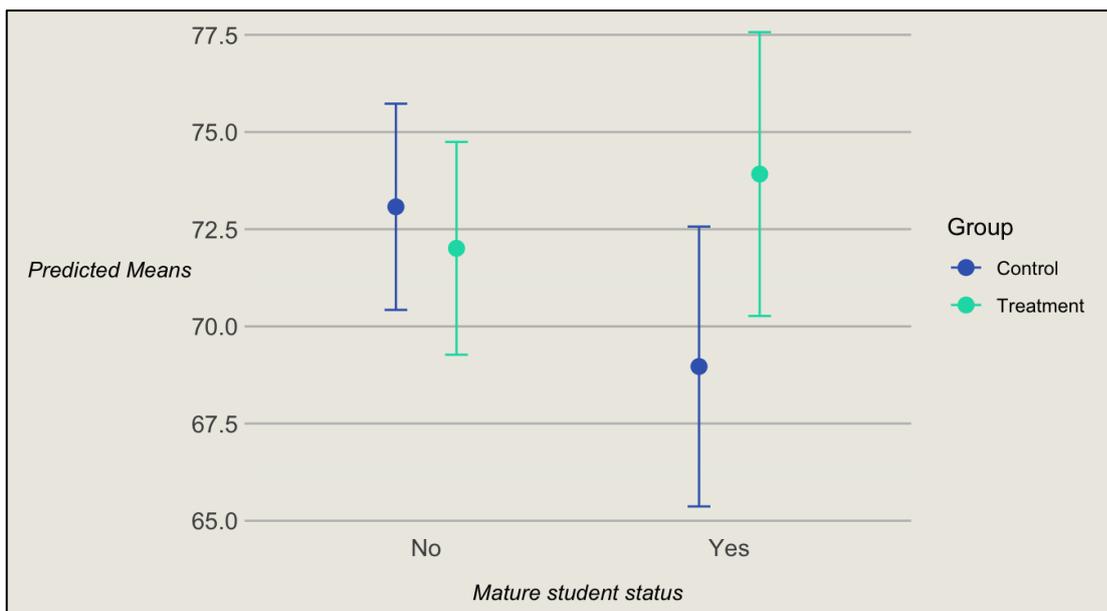


Table 12: Subgroup analysis of the effect of treatment assignment on number Blackboard logins (in-scope sample)

Variable	Subgroup	Interaction coefficient
Ethnicity (ref: White)	Asian	0.21 [-1.14; 1.55]
	Black	-0.40 [-1.79; 0.98]
	Other	-1.55 [-2.81; -0.29]*
Mature student (ref: No)	Yes	-0.08 [-1.08; 0.93]
IMD (ref: Q1)	Q2	0.08 [-1.08; 1.24]
	Q3	0.32 [-0.98; 1.61]
	Q4	0.61 [-0.69; 1.90]
	Q5	1.24 [-0.04; 2.52]
Department (ref: COE)	CRI	-0.09 [-2.08; 1.89]
	ENG	-0.15 [-3.20; 2.90]
	GMI	0.27 [-1.66; 2.21]
	IBI	-1.04 [-3.78; 1.71]
	SUL	-0.93 [-3.34; 1.48]
	ALH	-0.17 [-2.67; 2.34]
	IOE	0.90 [-1.20; 3.00]
	NUM	0.48 [-1.65; 2.62]

Variable	Subgroup	Interaction coefficient
	PSY	-0.75 [-3.04; 1.55]
	SAS	-1.32 [-3.69; 1.05]
	SLC	0.10 [-2.08; 2.27]

\*\*\* p < 0.001; \*\* p < 0.01; \* p < 0.05, +<0.1. Covariates include gender, ethnicity, disability status and baseline engagement (pre-intervention attendance in timetabled classes). Full regression tables provided in Appendix F.

Table 13: Subgroup analysis of the effect of treatment on attendance rate (in-scope sample)

Variable	Subgroup	Interaction coefficient
Ethnicity (ref: White)	Asian	-1.39 [-9.13; 6.35]
	Black	6.35 [-1.16; 13.85]
	Other	-4.61 [-12.12; 2.90]
Mature student (ref: No)	Yes	6.02 [0.92; 11.12]*
IMD (ref: Q1)	Q2	-5.70 [-12.67; 1.28]
	Q3	-6.89 [-14.13; 0.34]
	Q4	-8.65 [-15.38; -1.92]*
	Q5	-2.90 [-10.26; 4.45]
Department (ref: COE)	CRI	0.08 [-12.43; 12.60]
	ENG	10.10 [-5.54; 25.74]
	GMI	2.88 [-8.44; 14.20]

Variable	Subgroup	Interaction coefficient
	IBI	-0.62 [-15.95; 14.72]
	SUL	3.22 [-11.80; 18.24]
	ALH	2.23 [-10.39; 14.84]
	IOE	4.36 [-9.78; 18.50]
	NUM	4.03 [-6.77; 14.82]
	PSY	4.98 [-9.64; 19.60]
	SAS	-1.15 [-14.33; 12.04]
	SLC	-0.42 [-14.30; 13.47]

\*\*\* p < 0.001; \*\* p < 0.01; \* p < 0.05, +<0.1. Covariates in Model 1 include gender, ethnicity, disability status and baseline engagement (pre-intervention attendance in timetabled classes). Full regression tables provided in Appendix G.

### 5.3.6 Results of exploratory analysis

#### Wellbeing scores

The effect of the push notification on wellbeing was explored. None of the models found a statistically significant effect (see Appendix F: Regression tables). Note that only 93 students responded to the wellbeing survey (52 from the control group and 41 from the treatment group, out of which fewer than 10 received a push notification). As a result, these findings offer limited insight into the impact of the notifications on wellbeing because the test is not well powered. Given the low response rate, it is also possible that the students who participated in the survey may be systematically different from those who do not and thus this subset of students might not be representative of the full sample.

#### Effect of trigger timing of treatment on primary outcomes

The other exploratory analysis relates to the extent to which the time a participant joined the analytical sample (i.e., whether their engagement first dropped below 60% before notification one, two or three) influenced the treatment effect. Table 44 and Table 45 in Appendix F present the full results from a regression analysis that assessed

whether there were differential effects of the time a push notification was received on the primary outcomes. The primary model specification (Section 4.4.3) was run separately on three datasets, each one comprised of students who generated a low-engagement trigger for the first time in one of week five (period one), week seven (period two) or week nine (period three), using our operationalisation of the 60% threshold rule.

We find no statistically significant differences arising in either of the primary outcomes (attendance or blackboard logins) due to differential timing of when the student first triggered a notification. We present the coefficients in Figure 5 and Figure 6.

It must be caveated that students who generated a low-engagement trigger for the first time in week seven did not receive notification two (per Section 4.5.3). If they did not generate a low-engagement trigger in week nine, then they have not received the treatment, which may have played a role in attenuating the treatment timing effects.

Figure 5: Effect of trigger timing effect of treatment on Blackboard logins (analytical sample)

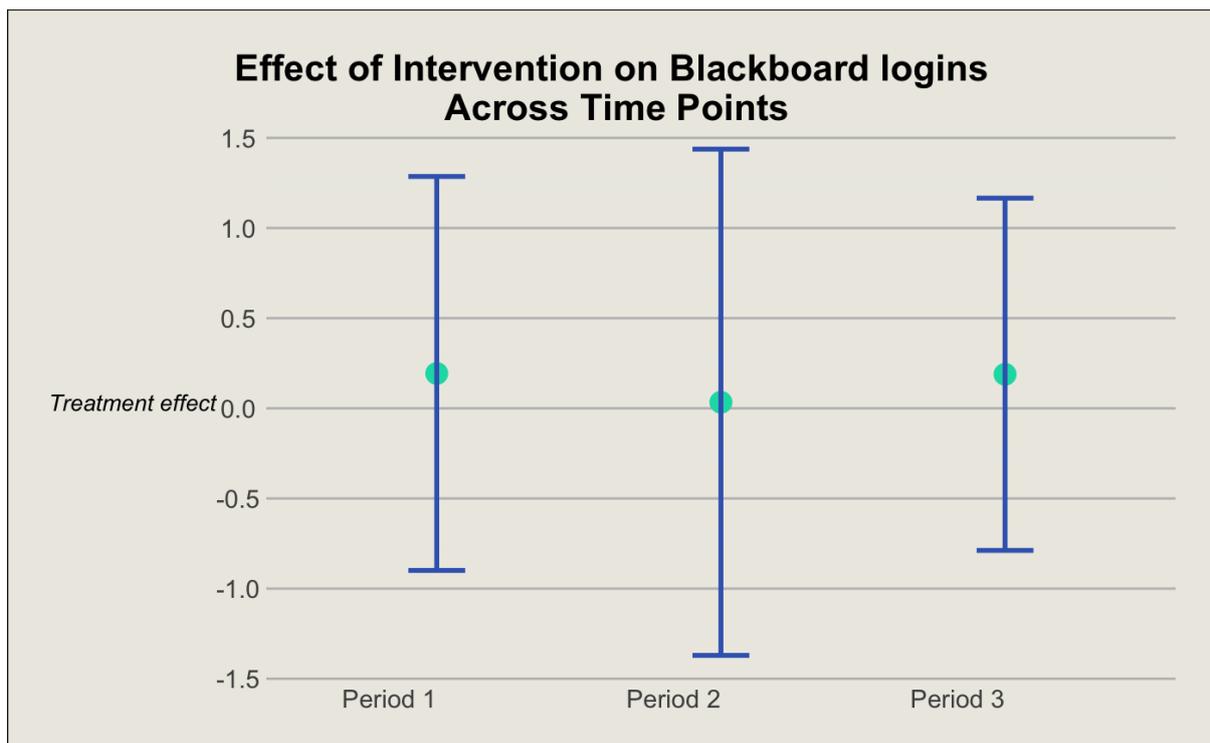
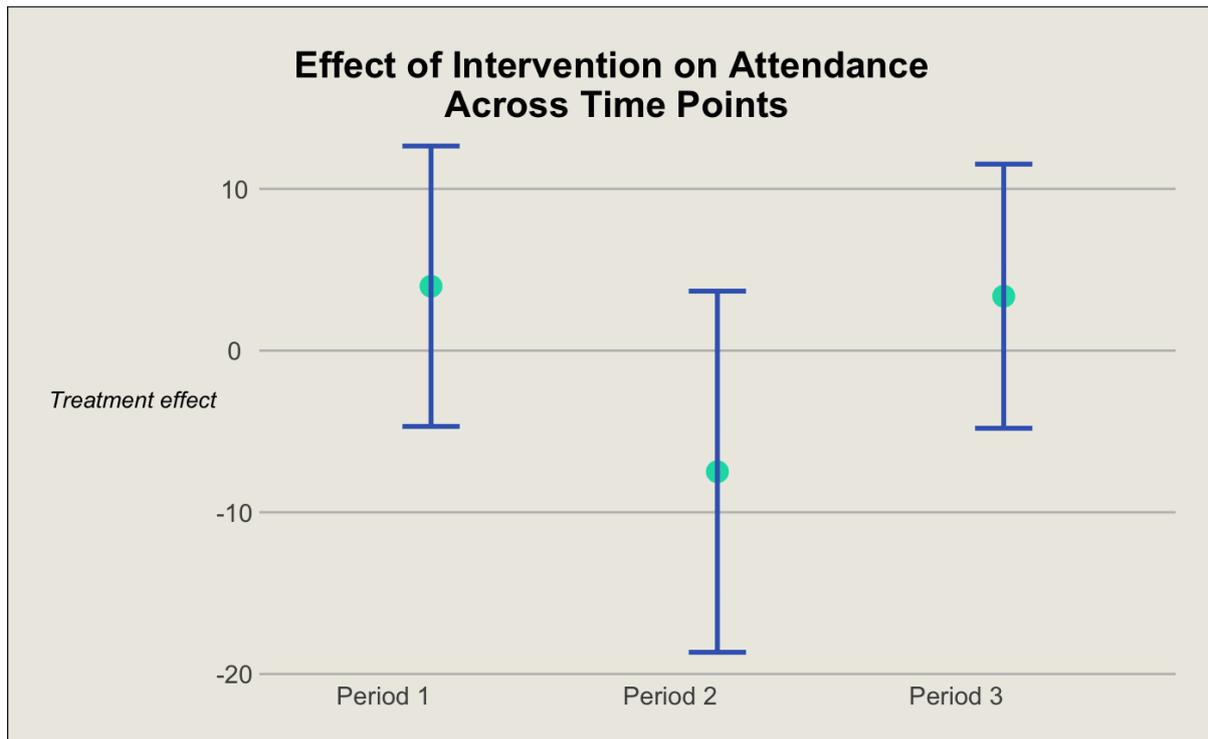


Figure 6: Effect of trigger timings effect on attendance rate (analytical sample)



#### 5.4 Review of study minimum detectable effect size

At the trial design stage, Minimum Detectable Effect Size (MDES) calculations were conducted to determine the minimum effect size that the study would be powered to detect, based on the following assumptions:

- Significance level: 0.05.
- Power: 0.8.
- Number of terms in model: 18. Comprising: treatment status, gender, ethnicity (four levels plus reference), engagement score, and department (11 levels plus reference).
- Power of covariates ( $R^2$ ): 0.3 (with no baseline data) and 0.7 (includes baseline measure).

It was assumed that randomisation would take place for 1,500 participants. Power calculations were run for outcomes from management information for 1,500 (all randomised), 700 (all triggered) and 500 (high attrition case) participant samples. Given that data on the primary and secondary outcomes were being sourced from management information at UoS, we expected there to be no attrition. We also calculated the MDES for the survey-based wellbeing measure, for 150 respondents (assuming 80% attrition, most likely scenario) or 700 respondents (no attrition). Table 14 presents the power calculations that were run before the trial.

Table 14: Power calculations with anticipated sample size

Sample	Sample size	R <sup>2</sup>	MDES
Management information	500	0.3 (no baseline)	0.21
	700		0.18
	1,500		0.12
Survey	150	0.7 (with baseline)	0.25
	700		0.12

Following trial implementation, the size of the actual in-scope sample exceeded initial expectations. The analytical sample included 660 students, as compared to the anticipated level of 700. This increased in-scope sample increased the statistical power of the study, increasing the ability for detection of smaller effects than initially anticipated. It must be noted also that the attrition level was substantial on the wellbeing survey, with only 93 responses. This was expected given the challenges associated with administering surveys on already disengaged students and therefore was classified as an exploratory outcome in the trial design.

Table 15 and 16 present the MDES observable from the trial, expressed both in terms of Cohen's d, providing a standardized measure, and the raw effect size, expressed in the primary unit of measurement. For the primary outcome (number of blackboard logins), the raw effect size is reported as the change in the number of logins), while for the other primary outcome (attendance rate), the raw effect is reported in percentage points unit.

Table 15: Power calculations with observed sample size (Data source: Monitoring data)

Dataset	Sample size	R <sup>2</sup>	Standardised MDES (Cohen's d)	Raw MDES (Number of blackboard logins)	Raw MDES (Attendance rate)
In-scope sample size as randomised	2,277	0.3	0.09	0.49	2.88
		0.7	0.06	0.33	1.92
Analytical sample size for primary analysis	660	0.3	0.17	0.73	6.11
		0.7	0.11	0.47	3.95

Table 16: Power calculations with observed sample size (Data source: Survey)

Dataset	Sample size	R <sup>2</sup>	Standardised MDES (Cohen's d)	Raw MDES (Score points)
Wellbeing survey sample	93	0.3	0.47	0.31
		0.7	0.31	0.21

The estimated treatment effects for the primary outcomes, presented in Table 10 and Table 11 are smaller than the ex-post MDES, as presented in Table 15. Therefore, the null result may arise either because the true effect is small or because the study was not sufficiently powered to detect effects of this magnitude.

## 5.5 Summary of impact evaluation findings

The impact evaluation sought to answer whether the intervention had a measurable effect on students' academic engagement and wellbeing status. Below is a summary of findings:

1. Academic engagement:<sup>11</sup>
  - a. **Primary outcomes:** we find no evidence that the intervention resulted in a higher number of Blackboard logins or higher attendance rates of students in the treatment group, as compared to the control group. This applies to both the in-scope and analytical sample.
  - b. **Secondary outcomes:** we find no evidence that the intervention resulted in a higher likelihood of accessing support services or escalation to tiered services, in the in-scope sample. There is a significant effect on escalation to tiered services using the analytical sample.
2. **Subgroup analysis:**<sup>12</sup> We find statistically significant differences (at the 5% threshold) in treatment effects on blackboard logins and attendance rates based on age, IMD quintile and ethnicity.
  - a. On attendance:
    - i. The treatment is less effective among students from Q4 of the IMD quintile ranking as compared to those in Q1, indicating that the

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<sup>11</sup> To what extent does the "engagement nudge" intervention increase re-engagement with education among students who drop below the 60% engagement threshold (logging in to Blackboard, attendance on campus, likelihood of progression to tiered support, likelihood of attending support services)

<sup>12</sup> To what extent is the "engagement nudge" intervention more or less effective for different groups of students? Specifically: ethnicity, mature student status, IMD quintile and department

- intervention may not be particularly beneficial for those from less deprived neighbourhoods.
- ii. The effect was stronger for mature students as compared to students below 21 years old.
- b. On blackboard logins
    - i. The effect was less effective on students who chose “other” as their response for ethnicity, as compared to white students.
    - ii. No differences at the 5% threshold were found with respect to department.
3. **Exploratory analysis:**<sup>13</sup> No statistically significant effect on wellbeing was found.

### 5.5.1 Summary of caveats and limitations: impact evaluation

Table 17: Summary of assessment of risk of bias assessment using RoB 2 tool for individually randomised parallel group trial

Domain	Comment	Risk of bias
Randomisation sequence and efficacy	<p>The study employed a robust randomisation process with stratification, ensuring that the assignment of participants to treatment and control groups was well balanced and free from selection bias. However, in addition to the intended population (full-time first year students) some students who were out of the scope of the trial were included in the randomisation. These out-of-scope students were excluded from the analysis, and subsequent checks found no concerns about the balance across the groups. Additionally, balance checks confirm that the sample meeting the low-engagement threshold also preserved balance across key demographic covariates.</p> <p>There is a potential concern that outcomes data may not have been correctly linked to students if a pseudonymisation error occurred. We flag this as a</p>	Low

<sup>13</sup> Does the engagement nudge improve the wellbeing status of students who drop below the 60% engagement threshold?

Domain	Comment	Risk of bias
	<p>risk because some spreadsheets contained data of students who did not match with the spine dataset, comprising of treatment allocation status.</p> <p>Although we could not formally verify this due to the absence of personal identifiers, we believe the likelihood of such an error is considered low since pseudonymisation carried out by UoS followed an established and routinely used procedure.</p> <p>Furthermore, any mislinkage is expected to be non-differential across treatment and control groups and is therefore unlikely to affect randomisation or bias estimated impacts. This is also supported by balance checks, which confirm consistency across groups.</p>	
<p>Deviations from intended intervention</p>	<p>The protocol stipulated that students with attendance falling below 50% would be deemed as disengaged and would receive the intervention. However, the intervention was later delivered to treatment group students whose attendance fell below 60%.</p> <p>Next, the intervention scheduled for delivery at time point two was not delivered to students who fell below the 60% attendance threshold for the first time during period two.</p> <p>Finally, we also could not access the absolute attendance in numbers to compute the biweekly weighted attendance rates. For the analysis, subsequently, we have used attendance in the week closest to the pre- and post-intervention time point.</p>	<p>Medium</p>
<p>Missing outcome data</p>	<p>Most of the outcome data was sourced from UoS's management information resulting in near-zero attrition. Therefore, for the primary outcomes risk of bias arising from missing data is low. There was a small number of non-matches in the Blackboard logins data but the large sample size overall means that this did not affect the analysis. Further, there</p>	<p>Low</p>

Domain	Comment	Risk of bias
	<p>were a larger number of non-matches in the secondary outcomes data, but the causes of this are unclear and it is unlikely to be correlated with treatment.</p> <p>We have classified this risk as low due to the substantive completeness of the primary outcome data and the ambiguity of the consequences of the non-matching secondary outcome data.</p>	
Measurement of outcome data	Outcome data were drawn from UoS's management information or were measured using reliable and valid instruments, with consistent procedures applied across all participants. There was no evidence of measurement bias limiting the possibility of systematic errors.	Low
Overall risk of bias score	While some deviations were observed (randomisation of students out of the scope of the intervention and inability to reproduce the trigger rule based on which intervention was delivered to the treatment group) as well as multiple revisions of the analytical dataset, overall, in our view these issues do not significantly compromise the reliability or validity of the study's conclusions. Robustness checks validate this, and CACE analysis has been conducted to address concerns around one-sided treatment non-compliance.	Medium

## 6. Implementation and process evaluation (IPE)

The aims of this implementation and process evaluation (IPE) are to examine how student engagement nudges were implemented, to understand the types of students who received nudges and to support decision-making to improve the use of nudges to support student engagement and wellbeing. Student engagement nudges were first introduced in this academic year (2024/25). As a result, the IPE is important for capturing key aspects of process as well as stakeholder perspectives to support continuous improvement for digital projects which support student engagement.

### 6.1 Research questions

The research questions (RQs) were derived from the theory of change articulated for the intervention to ensure the development of the intervention and evaluation was theory-based, and evidence-driven. Four research questions were articulated:

**RQ1:** Was the intervention implemented as intended (adherence)?

**RQ2:** What types of students received the intervention (reach, exposure)?

**RQ3:** What were the reactions to and experience of implementing or participating in the intervention (stakeholder perspectives)?

**RQ4:** How can the intervention be scaled and sustained over time (sustainability)?

### 6.2 IPE design and framework

Each research question was connected to specific IPE dimensions from TASO's IPE guidance: adherence, reach, exposure, stakeholder perspectives, and sustainability. Largely, these dimensions were selected due to their relevance to support the generation of lessons learned in the first year of intervention implementation. Further reasons these dimensions were chosen are outlined in Table 18 below.

Table 18: IPE dimensions

IPE Dimension	Relevance	RQ
Adherence	Examining adherence enables us to understand the differences between intervention planning and intervention implementation to improve the process for subsequent interventions. It can also add context (or provide explicit	RQ1

IPE Dimension	Relevance	RQ
	(limitations) where interventions achieve or fail to achieve their intended outcomes.	
Reach	Reach enables us to consider what proportion of the sample received a nudge and the extent to which different student groups received nudges. Enhancing our learner analytics capability forms part of our 'Transforming Student Support' strand within our Access and Participation Plan (APP) and nudges can play an important part to this development strand. This intervention is targeted at all L3 and L4 new entrants, but we wanted to explore student demographics of those who were more likely to generate a trigger. This will help inform decision making to mitigate against a lack of equality of opportunity whilst we evolve our student engagement strategies.	RQ2
Exposure	Exploring exposure supports our understanding of whether students received one or more nudges. It supports our understanding of persistent engagement challenges, how different course cohorts engage with their studies and whether different student groups trigger nudges more often.	RQ2
Stakeholder perspectives	We wanted to explore stakeholder perspectives to understand how we can nudge better and work with colleagues across the university to embed this as part of business-as-usual practice. The analysis includes stakeholder reactions to the wellbeing nudge as well as interview items to support continuous enhancement.	RQ3
Sustainability	Analysis of stakeholder perspectives on the sustainability of the intervention over time enables us to examine whether we have the systems and cross-institutional functional working to scale or continue long-term. Student perspectives inform how we can ensure the intervention is continually effective over time.	RQ4

The IPE is a mixed-methods study designed to answer the stated research questions. The approach considers different stakeholders' perspectives on the intervention including staff and students as well as whether the intervention was implemented as planned.

The IPE was informed by a combination of qualitative and quantitative information about the intervention. The information included: semi-structured interviews with staff to understand the implementation process, challenges faced during delivery, and

the potential effectiveness of the nudge process and opportunities for scalability, sustainability and improvement; semi-structured interviews with students (treatment and control) to explore perceptions and perceived benefits of the nudge and how the nudge framework may be improved; data from the management information system such as that collected at enrolment, from the learning analytics system and engagement with student support.

Table 19 presents the different sources of data informing this study against the research questions and dimensions included in this IPE. It also details whether any deviations were made from the initial research protocol.

Table 19: IPE Framework

IPE dimension	Data collection tool	Audience	Source of data	Data analysis method	RQs addressed	Protocol deviations
Adherence	Interviews	Delivery staff	Semi-structured interviews at end of the intervention	Thematic analysis	RQ1	None
Reach	Management information	L3 and L4 new entrants	Management information	Descriptive statistics	RQ2	None
Exposure	Management information	L3 and L4 new entrants, treatment group only	Management information	Descriptive statistics	RQ2	Dimension added
Stakeholder perspective	Interviews	L3 and L4 new entrants & delivery staff	Semi-structured interviews at end of the intervention	Thematic analysis	RQ3	None
Sustainability	Interviews	L3 and L4 new entrants & delivery staff	Semi-structured interviews at end of the intervention	Thematic analysis	RQ4	None

## 6.3 Data

As highlighted above, data for the IPE were collected through a range of sources of information following the five dimensions, as set out in Table 19.

- **Semi-structured interviews** were conducted with both students and staff to answer RQ 1, RQ3 and RQ4. The aim was to interview approximately 5-10 staff involved in the implementation of the programme and 15 students, but we were unable to recruit the planned sample size. See further information below.
- **Management information systems data** complemented the data collected in the semi-structured interviews to answer RQ2 (reach and exposure). This includes data collected by our enrolment system (SITS) and data collected from our attendance management system within our Beacon student app. These data are held within our data warehouse infrastructure.

### 6.3.1 Sampling strategy

To identify staff and students to participate in the semi-structured interviews, we used two different sampling strategies:

#### Staff recruitment

A snowball sampling approach was used to recruit staff to interview. The operational lead for this project identified staff involved in the implementation. The evaluation team successfully interviewed the five staff involved in the delivery of the intervention. Staff interviewed were from the following areas: Student Life, Digital Services, Business Intelligence and Management Reporting, Marketing Brand and Voice and Educational Enhancement and Impact.

#### Student recruitment

Stratified random sampling based on RCT arm allocation was initially used to identify 30 students from each arm of the trial and invite them to participate via email. Interviews were implemented on a first come, first serve basis with the intention to stop when fifteen interviews were conducted. This process was repeated three times ( $n=180$  students invited to interview) which resulted in five student participants. As a result, we extended the invitation to all treatment and control students to try to reach our intended sample size. We conducted a total of nine interviews using both approaches.

Table 20 below outlines each data collection tool, the intended sample size and actual sample size.

Table 20: IPE Sample Sizes

Data collection tool	Intended sample size	Actual sample size
Delivery staff Interviews	5-10 participants	5 participants
Student interviews	15 participants	9 participants (5 from the treatment group)

### 6.3.2 Research material design

The materials used for the semi-structured interviews include research invitation emails, participant information sheets and interview guides (see Appendix H).

- **Invitation email:** The invitation email was tailored to students and staff participants. It contained a link to the participant information sheet, consent form and signup sheet (Appendix Hi). The email also included information about the interview location incentives for participants.
- **Participant information sheet:** The participant information sheet provided clear and accessible details about the project, why students and staff have been contacted, and what participation in the study means for them and how they can opt out of the study if needed (Appendix Hii).
- **Interview schedules:** The interview schedules for staff and students Appendix Hiii) are divided into three sections: objectives of the study, introduction of the interviewer and the interview process, and the interview questions. The section on the interview questions consists of five sub-sections, each focusing on RQ1-4 with probes where necessary.

### 6.3.3 Interview conduct

Participants signed up for the interviews via email. Verbal consent was obtained prior to commencement of the interview. All interviews occurred via MS Teams and were recorded and transcribed automatically in Teams. The transcripts were quality assured by the researcher conducting the interview. The average length of an interview was 45 minutes. All participants were informed of their rights to withdraw and how the data from the interview will be stored, used and disseminated (see Appendix H for further information).

### 6.3.4 Approach to maximising response rates

Our approach to maximise responses from staff and students included the following:

- Offering student participants a £15 Amazon voucher incentive.

- Emailing invitations for interviews with two reminder emails.
- After three rounds of random sampling, opening recruitment to the entire eligible population via email.

## 6.4 Analytical strategy

Quantitative data were imported into the statistical package SPSS 29 to undertake descriptive statistics.

All qualitative researchers involved in the IPE underwent qualitative literacy training which uses the Small and Calarco (2022) framework for evaluating interview research for quality to enhance practitioner practice.

Thematic analysis was conducted using the qualitative data generated from the interviews. We used a data-driven approach to coding qualitative responses. Coding and theme generation were developed using the framework described in Braun and Clarke (2006).

Researchers read all available transcripts after initial data collection to further understand the data (familiarisation). After this process, researchers developed codes (or labels) to apply to relevant aspects of the transcript content and labelled these on the transcripts. These codes could be applied multiple times to one transcript. Quantifying aspects of the transcripts formed part of the thematic development process. Codes were then aggregated into broad themes and counted.

## 6.5 Deviations from study protocol

There were no deviations from the IPE design protocol other than the number of interviews secured. Initially, as per the protocol, the aim was to interview 15 student participants. However, only nine student participants were secured for interviews -- five of whom were from the treatment group and four from the control group.

## 6.6 Results

### 6.6.1 Was the intervention implemented as intended (adherence)?

Two key changes were identified compared to the proposed implementation of the intervention outside of this research process:

1. The notification threshold was changed from 50% to 60% attendance in the two weeks prior to the trigger date. This decision was made to ensure sufficient power for the RCT and to further support the [University's attendance and engagement policy](#). The policy states:

'The University recognises that to be successful with their academic studies students need to fully engage with the teaching and learning offered as part of their chosen award/programme. Attendance therefore at all formal teaching activity is expected.'

2. A data handling error at the second notification point reduced the sample that received this notification. While no inaccurate notifications were sent, 158 students in the treatment group who generated their first trigger at notification point two were not sent the notification. This was rectified for the third notification so that at notification point three all those who generated a trigger in the treatment group were notified.

56 codes were generated from the qualitative analysis of interview data to examine whether the intervention was implemented as intended. Most staff interviewed agreed (33 codes) that the project and tasks were implemented as planned and communicated clearly, and that data was inputted and retrieved effectively. One staff participant who supported the technical implementation said, *"from a technical point of view, yeah, everything went well. There was no problem that the notification went out, the people worked well together. We got all the data that we wanted."*

Staff agreed (11 codes) that the change to the notification threshold did not negatively impact the study. Staff agreed that the change to the threshold to include more students was perceived as 'a good thing.' One staff member suggested that *"we adjusted the trigger to make sure that we got a large enough population at the time. So that was quite promising because that suggested that students were engaging more than we anticipated."*

### 6.6.2 What types of students received the intervention (exposure, reach)?

The number of students who fell below the 60%-engagement threshold at each notification point is in Table 21. The percentage of students who fell below the engagement threshold increased over time from only 12.0% ( $n=272$ ) of the sample for notification 1 to 20.6% ( $n=468$ ) of the sample for the third notification.

Table 21: Number and percentage of students who met the 60% threshold to trigger a notification at each point

	Notification 1 (%)	Notification 2 (%)	Notification 3 (%)
Treatment	127 (11.1)	157 (13.8)	236 (20.7)
Control	145 (12.8)	172 (15.1)	232 (20.4)
Total	272 (12.0)	329 (14.5)	468 (20.6)

Most students' (71.0%,  $n=1616$ ) engagement scores did not fall below the engagement threshold at any point during the evaluation. A small proportion (5.3%,  $n=120$ ) of both the treatment and control sample met the threshold to receive all three notifications during the intervention.

Of the treatment students who generated a notification, the largest proportion only fell below the notification trigger point once (16.5%,  $n=188$ ). Fewer treatment students (7.5%;  $n=85$ ) triggered two notifications and only approximately 5% ( $n=54$ ) of the treatment sample generated three notifications.

Table 22: Number and percentage of students who met the threshold to trigger a notification

	No notifications (%)	At least 1 notification (%)	Total
Treatment	813 (71.3)	327 (28.7)	1140
Control	803 (70.7)	333 (29.3)	1136
Total	1616 (71.0)	660 (29.0)	2276 <sup>14</sup>

### **Ethnicity**

In terms of ethnicity, the largest proportion of students who were sent at least one notification were students with mixed or dual heritage (40.0%), followed by Asian students 36.5%. Black students in the treatment group were least likely to receive a notification; only 23.1% of Black students in the treatment group triggered at least one notification. A chi-square test of independence revealed a statistically significant relationship between ethnicity and notification generation,  $X^2(5, n = 1140) = 12.4, p = .03$ .

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<sup>14</sup> One student in the control group withdrew early in the academic year and was considered out-of-scope for the IPE sample but was included in the sample for the impact evaluation.

Table 23: Frequency of treatment students who generated at least one notification, split by ethnicity

	No notifications Count (%)	At least 1 notification Count (%)	Total
Asian	87 (63.5)	50 (36.5)	137
Black	83 (76.9)	25 (23.1)	108
Mixed	36 (60.0)	24 (40.0)	60
Other/Unknown	69 (73.4)	25 (26.6)	94
White	538 (72.6)	203 (27.4)	741
Total	813 (71.3)	327 (28.7)	1140

### **Gender**

Male and female students were similarly likely to generate at least one notification (29.2% and 28.2% respectively). Students with other gender identities had a higher proportion of students triggering at least one notification (28.6%), but sample sizes for this demographic were small. A chi-square test of independence revealed no statistically significant relationship between gender and notification generation,  $X^2(2, n = 1140) = .12, p = .941$ .

Table 24: Frequency of treatment students who generated a notification, split by gender

	No notifications Count (%)	At least 1 notification Count (%)	Total
Female	392 (71.8)	154 (28.2)	546
Male	401 (70.8)	165 (29.2)	566
Other	20 (71.4)	8 (28.6)	28
Total	813 (71.3)	323 (28.7)	1140

## Disability

Students with disabilities were more likely to trigger at least one notification. A chi-square test of independence revealed that students with a declared disability were significantly more likely to generate a notification,  $\chi^2(1, n = 1140) = 9.93, p < .002$ .

Table 25: Frequency of treatment students who generated a notification, split by disability status

	No notifications	At least 1 notification	Total
No declared disability	623 (73.8)	221 (26.2)	844
Declared disability	190 (64.2)	106 (35.8)	296
Total	813 (71.3)	327 (28.7)	1140

### 6.6.3 What were the reactions to and experience of implementing or participating in the intervention (stakeholder perspectives)?

Staff and student interviews were analysed to understand reactions to the notification intervention. The staff interviews highlighted the importance of effective communication and teamwork, and the perceived impact of the notifications. The students discussed their experiences of the notification, how it was delivered and the effect it had on their behaviour.

Staff interviews:

The staff interviews highlighted the following themes:

#### **Communication and teamwork**

The cross-institutional project team had effective communication and teamwork mechanisms (58 codes). Participation in the project was perceived to be a positive experience where there was proactive collaboration with teams and a sense that the work would lead to meaningful impact and insights. One staff member that provided support for the project said:

*"Yeah, it's been really good. Like the team we've been working with been so proactive. So, I guess sometimes we work with people in the university who maybe aren't as comms, like savvy, if that makes sense...it was like everything was already there and ready, which is great because it makes our life a bit easier and they already had the key deadlines in place and they knew that they wanted communications to go out by a certain date and that they had this whole plan with*

*it and that's really helpful when you work in [university department] to have people that so organised because it makes our jobs a bit easier."*

### **New opportunities for student engagement interventions**

The research project creates new opportunities for student engagement interventions (38 codes). There was agreement that participation in the project could possibly influence the way the student app Beacon might be used in the future, and that research into engagement impact increases opportunities for the University to innovate and trial new activities. One staff member reflected,

*"it's [the research project] giving us lots of development opportunities for beyond that and the - one of the byproducts of having the meetings and having the discussions is sort of forging a plan between [staff member] and myself, our executive director and [staff member in other area] in terms of what we're going to do next. And so that's helping us during a period of...changes, helping us sort of have some really helpful conversations for the for the future."*

### **Staff perception of notifications**

There were varied reflections on the perceived impact of notifications. This theme had two subthemes:

**The project was a 'nudge in the right direction' (50 codes).** The notification was perceived as positive and designed as a gentle, supportive reminder for students, which had the potential to positively influence behaviour. Staff believed that the notification should feel like a friendly, supportive check-in from a friend and they agreed the notification content achieved this. One staff member stated,

*"It's very like, nonspecific. It's like, how are you doing? And I feel like it's, it seems quite friendly, like a little check in. So I would hope that students would engage...But my first thought was I think this will engage people for sure, because it's slightly different as well to some of the notifications we send. They tend to be signposting for events or, you know, come on down to the Catalyst for this event or..."*

**Nudging will not please all students (34 codes).** Some of the staff interviewed expressed concerns that despite careful wording, notifications might be perceived negatively by some students potentially causing feelings of being monitored. Staff anticipated variability in student reactions to the notification. Staff interviewed agreed there was a need for personalised messaging as one approach would not meet every student's individual preference or circumstance. One staff member who works with students who were notified stated,

*“One [student] was, I remember, one said I'm embarrassed that I haven't been [attending], you know, so it probably it was just, I don't know, nudging the right direction. And then another one, another one. There was anger. There was anger there. Why are you, you know, watching me? Yeah, but all the others tend to be they were quite responsive and looking for support.”*

### **Appropriateness of using attendance data to trigger notifications**

Participants noted possible directions for the data used for notification trigger threshold (12 codes). Staff agreed this project raised important conversations regarding the definition of engagement and how the institution might evolve its measurement. Staff raised questions regarding the appropriateness of using attendance data to inform nudging about student wellbeing services. They highlighted that attendance data alone might not always be directly linked to student wellbeing or academic performance. As such, advertising support services based solely on attendance data could sometimes miss the mark, as poor attendance might not necessarily indicate underlying wellbeing issues.

Student interviews

Student interviews generated eight themes regarding this research question:

### **Student perception of notifications as motivating**

Students found the notification motivating (44 codes). Student participants interviewed reacted positively to the notification. Participants agreed the content was motivating and appreciated receiving a gentle reminder. Participants agreed that accessing the visualisation of their attendance data was particularly helpful and that viewing this prompted students to think about ways to improve their engagement. One student participant who received the notifications said,

*“I quite liked it...because it made me like sort of keep up with my attendance. Made me want to attend lessons more.”*

Another student who received the notification reflected,

*“So when I saw that notification, I'm like oh. Bit-not startled a bit- like Oh crap [laughs]. Let me check my attendance. Let me let me sort it out. Sort of thing.”*

### **Increased awareness of wellbeing support**

The content of the notification increased students' awareness of wellbeing support (29 codes). Student participants interviewed agreed they 'liked' the content of the notification. They agreed the information provided within the notification clearly outlined the support available for wellbeing, as well as other types of support options, and where to access help. Some student participants stated they became aware of support services they previously did not know existed. They believed the notification

provided enough detail to assist students who might require wellbeing support. Student interview participants highlighted that it can be intimidating to seek support independently and that notifications increase help-seeking behaviour. One student believed that the language of the notification is important to ensure take up is effective where needed. They suggested that

*“I think that'll put people off even more. I think it should be optional if you would like to speak to somebody here rather than we need to address it, because then I think that would attach to the anxiety, for example, that I'd have where? I'd feel like him in, you know, grade school, and I'm getting called up by the principal and, you know, with it being university, I think it needs to be a little bit more independent.”*

### **Confusion over the Beacon app's attendance and engagement tab**

There was initial confusion amongst students in the personal attendance and engagement tab on Beacon (63 codes; Appendix I). They stated they did not immediately understand what was being presented and found the metrics unclear. One student said, *“in that kind of way is easy, just the attendance bit, I would say it's a bit hard to like figure out what your attendance is.”*

Additionally, participants stated the similarity in colours of the visualisation made the information even harder to interpret. Due to these clarity issues, students mentioned they would likely close the app without taking any further action or steps to improve their engagement. However, one student participant who was more data savvy stated that, *“I love a bit of data. I'm one of those people, so I love seeing it all just laid out.”*

### **Student perception of notifications as clear and easy to understand**

Students found that the notification was clear and easy to understand (61 codes). Participants were shown the contents of the notification as part of the semi-structured interview. Both treatment and control participants found the notification clear and user-friendly. This includes the notification itself as well as article content linked within the notification. They noted that the information within the notification and linked information stood out effectively. One student stated,

*“whether it's bad or whether it's good, either way, it would kind of encourage the student to like click on to Beacon actually have a look for themselves, like where their attendance is at.”*

### **Is Beacon the best method of providing a notification?**

Participants were asked about usage of Beacon both and general and within the context of the notification.

**Beacon notifications are helpful (49 codes).** Students described Beacon notifications as useful for keeping them informed with their studies and upcoming university events. One student stated,

*“Well, you know when you just click on it, it'll tell you sort of news, what's going on and then also it just keeps you up to date with my timetable, just keeps me knowledgeable.”*

They valued Beacon notifications providing them with practical details such as timetabling information on any room changes and class locations. Participants agreed that Beacon is easy to use and convenient making it an accessible tool for managing the life whilst at university.

Beacon is not the best way to receive notifications (51 codes). Student participants felt that in some instances Beacon is not the best place to disseminate important information. In terms of attendance, they perceived they would engage more with emails from lecturers rather than Beacon notifications. This is because emails from lecturers were seen as more important, specific and personally relevant. Beacon was perceived as general information sharing platform not directly related to individual courses or student needs. Students also observed that Beacon notifications might be missed if they were not actively using the app. Consequently, emails were seen as more important, personalised, and likely to be read.

### **Students' definition of engagement differs from project**

Engagement does not align with students' definition (53 codes). The students interviewed defined engagement more broadly than our project. One student participant stated,

*“For me personally, it's more the engagement in class, if anyone's- when people are raising their hand or like talk- like talking to a lecturer, I'd also even say if they're more engaged in the assignment, if they're actually doing it not just the week before, if that makes sense.”*

Interviewees suggested that engagement includes active classroom participation and active information-seeking to deepen their understanding of their subject. Another student stated, *“I feel like engagement's quite individualistic and I think some things that will work for some people won't work for other people.”* Consequently, students felt that the engagement display could potentially be discouraging, especially if Beacon were not relevant or extensively used within their specific courses.

#### 6.6.4 How can the intervention be scaled and sustained over time (sustainability)?

Staff interviews were analysed to better understand how the intervention might be sustained and scaled over time. Staff noted the timing of the notification was important, that the thresholds and the notifications themselves might be adapted, and that it is important to improve the integration of different data systems.

Four themes were generated:

##### **Importance of notification timing**

'Timing is everything' for the notifications to be effective (34 codes). Notifications should be strategically timed around key points in the student journey including key assessment points in the academic calendar. Staff emphasised the importance of mapping notifications carefully to these periods to achieve optimal effectiveness. Staff noted that well-timed notifications would offer valuable opportunities to observe and understand how student responses to the notifications might change as part of the overall student journey. Students offered up a range of different ways in which notifications could have greater impact. One student participant suggested,

*"I think everyone should receive it, and in terms of how often I would say maybe like at the end of each term like as a reminder that this term, this was your attendance and then when the new term starts, maybe they could send out another- another e-mail like a target for example to say that your target for this term is this. And then at the end of the term again you can get another reminder to say that whether you've met your target attendance or not. So, I would say maybe every term is OK."*

##### **Adaptations to trigger type and thresholds**

We should think about adjustments of trigger type and trigger thresholds (22 codes). Staff discussed ways in which the institution might adapt the notification triggers to better support student wellbeing in the future. They agreed careful consideration was needed to determine what student groups to target and why. Staff also emphasised the importance of checking student enrolment status or localised knowledge into the student to ensure the appropriateness of the notifications. Students also had diverse opinions of at what threshold are appropriate ranging from 95% attendance to less than 50% attendance.

##### **Continuous improvement to notification content**

We need to continuously improve notification content (34 codes). Staff suggested adapting the notification content over time to maintain relevance to our students as best practice in both behavioural insights and increasing student engagement. Staff

recommended continuous improvement of both the appearance and content of notifications to prevent them from becoming repetitive or boring to our students. Staff and students agreed that personalised messaging and tailored information would be key to increasing its effectiveness. Staff agreed that introducing varied and well-scoped notifications would help sustain the project's effectiveness in the long term. One student suggested enhancing the notifications so that positive or negative changes were highlighted to help incentivise students, *"And maybe if it is possible, do you know like, oh, it's 10% increase from last week or it's because it gives more incentive."*

### **Systems integration should be prioritised**

We should prioritise systems integration (39 codes). Staff highlighted the need for an integrated student support system to streamline processes, data collection and data monitoring involved in current delivery of the notification. One staff member stated,

*"at the moment there is some manual intervention between those systems, so the dashboard provides us with the data needed to see which students are triggered. However, that system isn't currently talking to Beacon, so there's a manual request...a manual transaction required of a person."*

Staff identified current challenges due to fragmented systems and manual data handling. For example, they suggested that the use of separate platforms can limit a comprehensive understanding of a student. Staff perceive that enhanced integration would increase transparency which would enable staff to access information more easily and provide tailored, timely support to students.

## **6.7 Summary of IPE findings**

The summary of the key findings from the IPE is presented below in terms of the following dimensions: Adherence, Reach, Exposure, Staff and Student perspectives, and Sustainability.

### **Adherence**

Although the notification was implemented in line with the design of the RCT and no students in the control group received the notification a data handling error resulted in a smaller proportion of the treatment sample receiving the second notification than were eligible to receive it. The attendance threshold for generating a notification was changed from 50% attendance or lower over the preceding two weeks to 60% or lower. Delivery staff who were interviewed agreed that the cross-institutional team was effective in carrying out the notification intervention.

### **Reach**

Just under a third (29.0%;  $n=660$ ) of both the treatment and control sample met the threshold to generate a notification at least once during the intervention. There were

significant differences in the likelihood of being sent a notification between students with different ethnic backgrounds; the largest proportion of students in the treatment group to be sent at least one notification were from mixed or dual heritage (40.0%,  $n=24$ ). Students with disabilities were statistically more likely to trigger at least one notification and 20% of all students who received three notifications had a declared mental health condition/s ( $n=11$ ).

### **Exposure**

A small proportion (5.3%,  $n=120$ ) of both the treatment and control sample met the threshold to receive all three notifications during the intervention.

### **Staff perspectives**

Staff enjoyed working together on the project and believed it was an important part of a holistic approach to engagement. Staff participants agreed the notifications were going “in the right direction” but were also concerned that notifications would not please all students. Staff questioned whether attendance was always linked to poor wellbeing and that it might not always be appropriate to use low attendance to provide notifications to student wellbeing services.

### **Student Perspectives**

Overall, students liked the notification, found it motivating, agreed it increased awareness of student support services, and increased help-seeking behaviour. Some students believed the content and messaging was particularly important to ensure take-up for the relevant support or wellbeing service. However, they thought some of the linked engagement data was confusing.

Students also found that, whilst the Beacon notifications were helpful, there were possibly more effective modes (e.g. emails from academics) to receive the information.

Students believed that engagement was broader than attendance only and notifications should take that into consideration as part of continuous improvement.

### **Sustainability**

Staff agreed that the key to sustainable implementation of notifications was prioritising systems integration and methods to automate aspects of this work which was completed manually.

Staff agreed that continuous enhancement of our nudging strategy was needed. This included a plan for increasing the variety of types of notifications whilst ensuring personalised and tailored content. In addition, the timing of notifications and attendance thresholds used to generate them should be revised on a regular basis.

### 6.7.1 Summary of caveats and limitations: Implementation and process evaluation

There are several limitations which affect how we interpret the findings from this evaluation. We experienced challenges in recruiting student participants using random sampling and although we aimed to interview fifteen students, we were only able to interview nine. This smaller sample size limits the depth and robustness of the insights we can draw from the evaluation. We changed our sampling approach from stratified random sampling to an open-invitation method to increase participation. This shift may have introduced self-selection bias, as students who volunteer could differ systematically from the broader population of L3 and L4 new entrants. The intervention was designed specifically for our institution and as a result the findings may have limited generalisability to other institutional contexts.

## 7. Discussion

This evaluation explored the impact of an app-based notification on student engagement and wellbeing, compared to the university's existing email-based support system. While the intervention was grounded in a proactive approach, the findings suggest that there exists limited evidence of its impact on student engagement. However, the results enable us to derive key insights and several implications for the design and targeting of early interventions.

First, there was no significant effect of the intervention on the primary outcomes of interest: attendance and the number of Blackboard logins. This held true for both the analytical sample ( $n=660$ ) and the full in-scope sample ( $n=2,277$ ); although there was a larger effect for the latter. These results suggest that while the push notifications administered by UoS provide alerts to students, they are not very effective at reversing disengagement, especially for those who are at the lower end of the engagement spectrum.

This lack of impact may point towards two potential limitations: i) limitations in the design of the intervention and implementation or delivery processes in UoS and ii) a broader limitation of the one-size-fits-all approach of the intervention, which is not based on the best evidence about effective messaging in addressing low participation in academic settings.

The first limitation is supported by the IPE as students shared mixed views on the notifications. Although students often appreciated the tone and found the reminders motivating, others also described them as generic, or not relevant to their context. Some students also noted a preference for personalised messaging. They suggested they may have been more likely to act if messages were sent by known academic staff

(instead of central university communications) and if the messages were tailored to their specific needs.

Furthermore, some students found the Beacon app's display of engagement data confusing, which may have affected their understanding of how to act on the notification. In fact, some shared they would have preferred the app notification to be accompanied by emails for clarity, particularly emails from known academic staff. Overall, the perceptions surrounding lack of personalisation and simplicity may help explain why notifications increased awareness but failed to trigger behavioural change and increase engagement.

Next, staff noted a range of implementation challenges. While they supported the intervention's aims, they highlighted barriers including the lack of integration between different systems and poor data automation leading to manual errors handling data. They also highlighted possible timing issues of the notifications with some saying the notifications were sent too late in the term. These process issues may help explain the lack of effect seen in the impact evaluation.

In relation to the second limitation, existing literature on improving student engagement via nudges emphasises that the effectiveness of an intervention often depends on how the information is framed and presented. For instance, a study conducted by Rogers and Feller (2024) showed that emails presenting the specific number of days a student was absent (rather than absences presented in percentages) and how that compares to their typical peers' absences improved outcomes and was an important part of an effective intervention design. Presenting data in a simplistic manner and in a way that can emphasise the degree of disengagement in both absolute (total number of absent classes) and relative terms can be an effective way of focusing students' attention on the areas that need behavioural change. As a result, the way students' attendance data was presented within the Beacon app could partly explain the lack of impact found in this trial as it may have failed to provide clear and actionable asks shown in other more successful nudge interventions.

Another finding was that students in the treatment group may have been more likely to escalate to tiered support. This support mechanism is triggered when attendance drops below 10% and there are zero Blackboard logins. This is counter to the goal and predicted impact of the intervention. Tiered support, as previously discussed, is reserved for students facing the most severe disengagement. The fact that this escalation is statistically significant when controlling for covariates suggests that the intervention may have been ineffective in limiting further disengagement – and, in some cases, may even coincide with worsening participation. The IPE raised concerns with staff sharing that the timing of the notifications may have been too late in the term and in that context, notifications alone would not be sufficient to trigger behaviour change, especially amongst students who are already disengaged. This

raises the possibility that app-based notifications alone, without personalised follow-up and other communication mechanisms, might be insufficient for students on a downward trajectory.

Finally, the exploratory subgroup analysis suggests some element of nuance and supports the second limitation highlighted above. Students in the “other” ethnicity category are engaging less on Blackboard compared to the baseline group. On attendance, we observe a negative coefficient for students in IMD Q4, which is statistically significant at the 10% level. Additionally, we find that students older than 21 years have a higher attendance, compared to students in the treated group who are less than 21 years old.

These findings suggest that the intervention is affecting students differentially based on which group they belong to. This highlights the need to tailor emails with the contextual sensitivity needed for students to connect with the content given their specific challenges. It also raises some additional questions about how different groups interpret institutional monitoring and support efforts, especially when these efforts are not accompanied by human interaction, something which can be explored in the future. This concern was also raised by staff in the IPE where they noted that while some students found notifications encouraging or motivating, others may have felt uncomfortable due to privacy concerns and felt they were being monitored. There were some differences in notification responses according to demographic differences, for example the IPE also found that Black students were amongst the least likely to receive notifications. This raises questions about how different groups may interpret this type of intervention.

Overall, while the IPE found that the notifications increased awareness of students’ engagement patterns and the available support services, the impact evaluation found the notifications did not trigger behavioural change. The intervention did not succeed in improving core outcomes (VLE logins or attendance) or reducing escalation to formal support. These findings suggest that the push notifications could be redesigned to provide a simpler and more direct presentation of the degree of student disengagement. At the same time, the intervention could be further strengthened through greater tailoring to students’ needs and contexts, so that the nudges prompt students to move beyond small, immediate responses (such as increased awareness) but support behavioural change and sustained academic re-engagement, particularly among at-risk students.

Furthermore, it is worth emphasising the intervention’s unintended association with escalation to tiered support (found in the analytical sample) underscores the need for caution. Timing, targeting, and student perceptions on institutional monitoring must be considered. The IPE also raised concern about overly relying on attendance data as a meaningful or sufficient outcome metric to understand student engagement,

wellbeing or academic performance. Engagement should be understood more broadly, beyond logins and system usage (e.g. active classroom participation and information seeking). This finding may suggest there is a need for a more holistic approach to measuring engagement that does not solely rely on attendance data.

To improve effectiveness, future iterations can potentially explore combining digital notifications with more relational, human-centred, one-on-one outreach, especially for those approaching critical thresholds of disengagement. Equally important is the need to account for contextual and behavioural differences so that interventions are more responsive to students’ different socioeconomic realities, lived experiences and preferences.

## 8. Roles and responsibilities

This evaluation was a collaboration between TASO, the Policy Institute at King’s College London, and University of Staffordshire. Each organisation led a different aspect of the design, delivery, and evaluation of the wellbeing intervention.

TASO was the commissioning body, with funding provided via the Cabinet Office/HM Treasury Evaluation Taskforce’s Evaluation Accelerator Fund. The impact evaluation (IE) was designed and delivered by the Policy Institute at King’s College London. UoS delivered the intervention and led the design and delivery of the IPE. Table 26 provides a detailed breakdown of roles and responsibilities across the organisations.

Table 26: Roles and responsibilities

Organisation	Name	Role and responsibilities
TASO	Dr Rob Summers	Research Manager
	Christoph Koerbitz	Chief Research Officer
	Luke Arundel	Research Officer
	Mikayla Boginsky	Research Officer
King’s College London	Susannah Hume	Principal Investigator
	Beti Baraki	Co-investigator, Project Manager
	Irene Soriano Redondo	Theory of Change Lead
	Parnika Purwar	Researcher, quantitative

Organisation	Name	Role and responsibilities
	Megan Liskey	Researcher, project coordination
University of Staffordshire	Christina Matthews	Executive Director of Student and Academic Services
	Paul Mahoney	Head of Library and Learning Services
	Jo Blaiklock	Head of Student Support and Wellbeing
	Kirstie Brookes	Customer Experience Manager
	Vanessa Dodd	Head of Research and Evaluation

## 9. Ethical considerations

### Ethical approval

This research received ethical approval from the University of Staffordshire Ethics Committee.

Ethical case reference: SU\_24\_004

Date of ethical clearance: 9 October 2024

### Consent

For the impact evaluation, the University of Staffordshire was responsible for gathering students' consent to participate in any data collection activities required and ensuring privacy notices are clear about how student data can be shared, including with the evaluators.

In addition, a two-layer passive consent approach was used for the quantitative aspects of the RCT. This is in line with recent student engagement RCTs in English Higher Education (Summers, et al., 2024). To ensure transparency we informed students of the study via all student newsletters that are disseminated during the lifecycle of the RCT. These communications provided a summary of the study with the option to click through for more information including the opportunity to opt out; this option was available up to the point of pseudonymisation of the datasets.

For the semi-structured interviews in the IPE, all participants were provided with an informed consent sheet at least one week prior to the interview (see Appendix I). This outlined the purpose of the research, how the data will be stored, who will have access to it and how it will be shared, how long it will be stored for and how their data can be removed if they wish to withdraw. All participants were asked to give verbal consent to participate in the research.

Participants in the semi-structured interviews were also given the opportunity to ask any questions prior to the commencement of the interview and were reminded of their right to refuse to answer any question without explanation. Further to this, they were informed about the process of withdrawing consent to use their data. The time limit given for withdrawal was up to two weeks from the point of the interview at which point interview data was transcribed and pseudo-anonymised.

### Data protection

The University of Staffordshire, Kings College London and TASO have a Data Sharing Agreement and agreed data protection protocols for this project. All policies and procedures in place to transfer, store, process, analyse, and dispose of data securely are in line with the 2018 Data Protection Act and UK GDPR requirements.

All three parties were Joint Data Controllers for the duration of the evaluation. However, the University of Staffordshire are owners of the data that is collected as business as usual on the Data Subjects, so may keep this data for their own purposes.

All student data for the evaluation has been de-identified before being securely transferred by the University of Staffordshire to Kings College London for the evaluation's analysis. They received anonymous data with unique IDs only. The legal basis for processing this data is legitimate interests. Data will be shared with Kings College London via the University of Staffordshire secure OneDrive with restricted access. Files will be encrypted and password protected. Access to the drive will only be granted to members of the Staffordshire research team, our Data and Business Intelligence team and Kings College London. After the project, Kings College London access to the drive will be removed.

Interview data was also recorded and stored on the research team's secure SharePoint folder at the University of Staffordshire, with access restricted to only the research team and activity evaluation leads. The recording was deleted once it had been transcribed. Access to transcriptions were restricted to the same colleagues indicated above. The legal basis for processing this data is informed by freely given consent. The University of Staffordshire's student privacy notice can be found [here](#).

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# 11. Appendices

## Appendix A: Impact table

Table 27: Impact Table

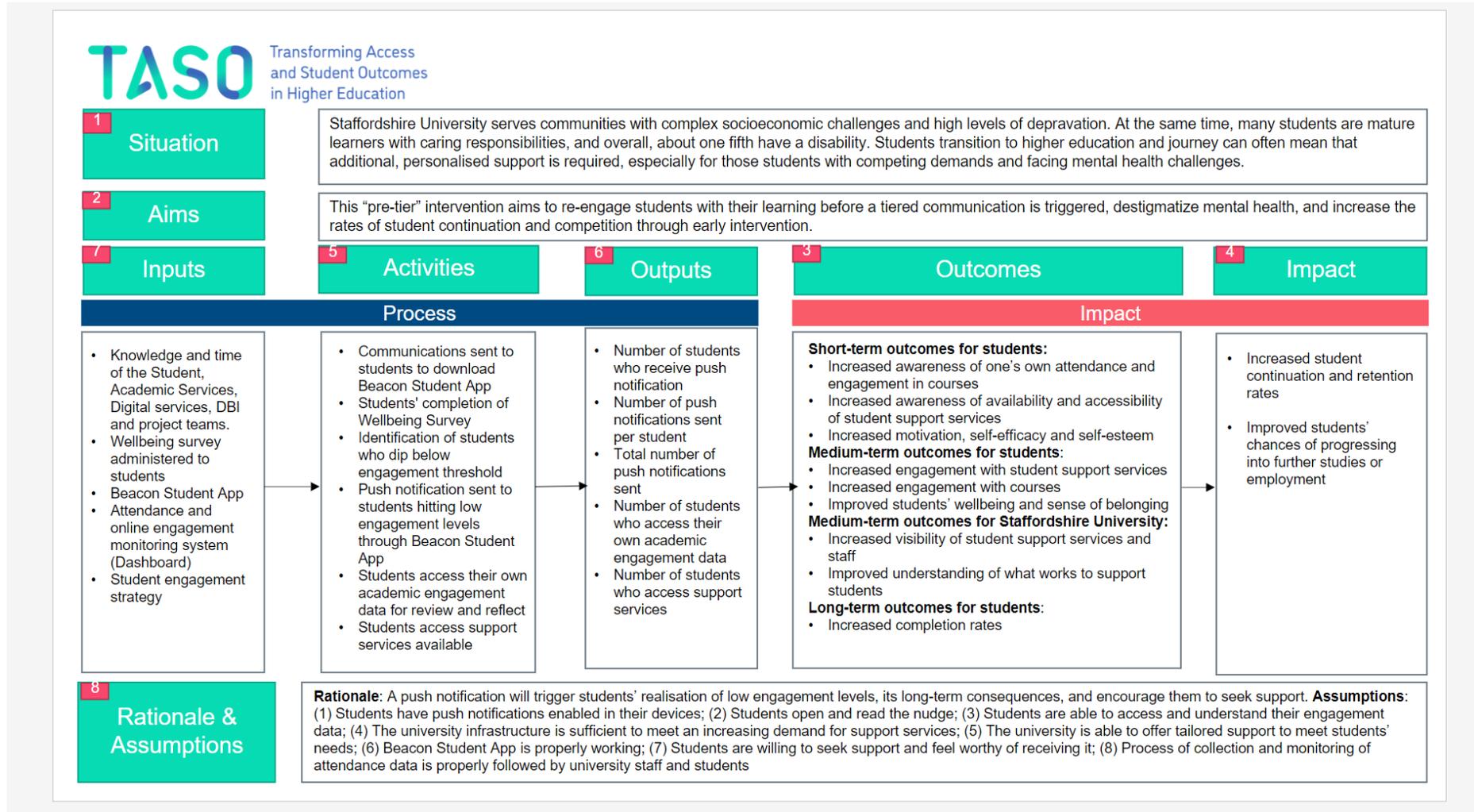
Sample	Outcome	Sample size	Coefficient estimate	Estimated 'real world' effect	Evaluation security (1 = not at all secure 5 = very secure)
In-scope sample	Number of blackboard logins	2277	0.34 [-0.09; 0.77]	Statistically insignificant as confidence intervals contains zero. Multiple specifications consistent.	5
	Attendance rate	2277	0.78 [-1.59; 3.16]	Statistically insignificant as confidence intervals contains zero. Multiple specifications consistent.	5
	Progression to tiered support	2277	0.01 [-0.00; 0.02]	Statistically insignificant as confidence intervals contains zero. Multiple specifications consistent.	4
	Likelihood of accessing	2277	-0.00 [-0.02; 0.01]	Statistically insignificant as confidence intervals contains zero.	4

Sample	Outcome	Sample size	Coefficient estimate	Estimated 'real world' effect	Evaluation security (1 = not at all secure 5 = very secure)
	support services			Marked down due to missing values but multiple specifications consistent.	
Analytical sample	Number of blackboard logins	644	0.16 [-0.49; 0.81]	Statistically insignificant as confidence intervals contains zero. Multiple specifications consistent	5
	Attendance rate	652	1.76 [-3.61; 7.14]	Statistically insignificant as confidence intervals contains zero. Multiple specifications consistent	5
	Progression to tiered support	660	0.05 [0.01; 0.09] *	Statistically significant as confidence interval does not contain zero. Marked down due to missing values but multiple specifications consistent	4
	Likelihood of accessing	660	-0.01 [0.03; 0.00]	Statistically insignificant as confidence intervals contains zero.	4

Sample	Outcome	Sample size	Coefficient estimate	Estimated 'real world' effect	Evaluation security (1 = not at all secure 5 = very secure)
	support services			Marked down due to missing values but multiple specifications consistent	

## Appendix B: Theory of change illustration

Figure 7: UoS Engagement notification Theory of Change



## Appendix C: Data sources and merging

Table 28: Summary of data sources and merging

Source spreadsheet	Purpose	Unique individuals in dataset	Matching variable <sup>1</sup>	Sample matched to randomisation
Allocation	Allocation and demographics	2655 <sup>2</sup>	Student number (SN)	-
Key	Connecting Beacon data to student record	296	SN + User ID (UID)	296
Notifications	Treatment record	295	UID	295
Blackboard 1	Primary outcome	2440 <sup>3</sup>	SN	2270
Blackboard 2	Primary outcome	2768 <sup>3</sup>	SN	
Attendance 1	Primary outcome	2452 <sup>4</sup>	SN	2277
Attendance 2	Primary outcome	2784 <sup>4</sup>	SN	
Student support appointments	Secondary outcome	868	SN	206
Wellbeing appointments	Secondary outcome	94	SN	
Careers appointments	Secondary outcome	79	SN	
Tier escalation	Secondary outcome	128	SN	59

Source spreadsheet	Purpose	Unique individuals in dataset	Matching variable <sup>1</sup>	Sample matched to randomisation
Wellbeing score	Exploratory outcome	111	SN	93

1: These were pseudonymised by UoS

2: 378 student were removed due to being out of scope and incorrectly included in the randomisation

3, 4: There were a number of duplicates across these datasets

## Appendix D: Code for randomisation / analysis

# Preliminaries ----

# Purpose: This code has been developed to enable staff from Staffordshire University

# to run the randomisation as per the protocol for the Analytics for Wellbeing Trial,  
funded by TASO.

# The code was prepared by [NAME]

# Please do not modify the code. If the code does not run or you have concerns

# about how it is running, please contact [NAME].

# Please do not share this code beyond the AWT project team without checking first.

# Date: 03/10/24

# Version: 2

## Clear the environment ----

```
rm(list = ls())
```

## Install required packages -----

# To load and save xlsx - let us know if the data needs importing in a different format

```
install.packages("openxlsx")
```

```
library(openxlsx)
```

```
install.packages("dplyr")

library(dplyr) # To enable cleaning

install.packages("tidylog")

library(tidylog) # To make dplyr more communicative

install.packages("randomizr")

library(randomizr) # For randomisation

# Set the Working Directory ----

# Add the file path of the randomisation data file here: NB R requires forward slashes
between folder levels - i.e. C:/Documents rather than C:\Documents

setwd("")

# Import the randomisation data file

data <- read.xlsx("FILENAME.xlsx") # Change name of file within quotes -
"FILENAME.xlsx"

ls(data) # Check headings in data

# This code assumes the following variables are present in the input data
# and that these are the exact column names (i.e. row 1 of the input spreadsheet)
# describing those variables
## DepartmentID - the student's department of primary study
```

```

## Gender - the student's gender

## Ethnicity - the student's ethnicity

# Other variables may be present in the spreadsheet without impacting the
randomisation

# the order of columns doesn't matter.

# The randomisation creates a variable called Allocation, which represents whether
# that student has been assigned to Treatment or Control.

# Per the Protocol, Treatment is defined as follows:

## Treatment group will receive an app-based notification to access support with
trackable links to support services.

## Control group will receive business as usual support.

set.seed(011024) # Set randomisation seed so that randomisation is consistent over
rerunning code

data$Allocation <- block_ra(blocks = data$DepartmentID, # Department is the
stratification variable, replace this if the variable is renamed

    prob = 0.5, # 50/50 chance of treatment or control

    conditions = c("Control", "Treatment")) # Conditions are labelled "Control"
or "Treatment"

# Checks on the randomisation - per protocol

# Check stratification has worked

```

```

tab_department <- data %>%

  group_by(DepartmentID) %>% # Change this if the name of the Department variable
  changes

  summarise(Count_treat = sum(Allocation=="Treatment"),

            Count_control = sum(Allocation=="Control"))

# Check balance on gender

tab_gender <- data %>%

  group_by(Gender) %>% # Change this is the name of the Gender variable changes

  summarise(Count_treat = sum(Allocation=="Treatment"),

            Count_control = sum(Allocation=="Control"))

# Check balance on Ethnicity

tab_ethnicity <- data %>%

  group_by(Ethnicity) %>% # Change this if the name of the Ethnicity variable changes

  summarise(Count_treat = round(sum(Allocation=="Treatment"), -1),

            Count_control = round(sum(Allocation=="Control"), -1))

# Write balance information

dataset_names <- list("Department" = tab_department, Gender = tab_gender, "Ethnicity"
= tab_ethnicity)

write.xlsx(dataset_names, file="balance_checks.xlsx")

# This file will generate in the same folder as the input spreadsheet. Send it back to us
please!

```

## Appendix E: Description of baseline sample and pre/post trends

### Randomised Sample characteristics

Table 29: Socio-demographic characteristics of randomised sample that are in-scope for the trial

		Full		Treatment		Control	
Characteristic		n	%	n	%	n	%
Mature student	No	1,644	72.2	838	73.6	806	70.9
	Yes	632	27.8	301	26.4	331	29.1
Ethnicity	Asian	265	11.6	136	11.9	129	11.3
	Black	208	9.1	108	9.5	100	8.8
	Other	326	14.3	154	13.5	172	15.1
	White	1,478	64.9	742	65.1	736	64.7
Gender	Male	1,107	48.6	565	49.6	542	47.7
	Female	1,170	51.4	575	50.4	595	52.3
IMD Quintile	Q1	671	31.1	345	32.2	326	30.0
	Q2	447	20.7	213	19.9	234	21.5
	Q3	343	15.9	177	16.5	166	15.3
	Q4	379	17.6	173	16.2	206	19.0
	Q5	317	14.7	163	15.2	154	14.2
Disabled	No	1,668	73.3	843	73.9	825	72.6
	Yes	609	26.7	297	26.1	312	27.4
Number of students: 2,277							
Source: UoS management information							

## Analytical sample characteristics

Table 30: Socio-demographic characteristics of analytical sample

		Full		Treatment		Control	
Characteristic		n	%	n	%	n	%
Mature student	No	483	73.2	243	74.3	240	72.1
	Yes	177	26.8	84	25.7	93	27.9
Ethnicity	Asian	92	13.9	50	15.3	42	12.6
	Black	52	7.9	25	7.6	27	8.1
	Other	107	16.2	49	15.0	58	17.4
	White	409	62.0	203	62.1	206	61.9
Gender	Male	337	51.1	165	50.5	172	51.7
	Female	323	48.9	162	49.5	161	48.3
IMD Quintile	Q1	218	35.2	115	37.8	103	32.7
	Q2	114	18.4	48	15.8	66	21.0
	Q3	104	16.8	55	18.1	49	15.6
	Q4	106	17.1	47	15.5	59	18.7
	Q5	77	12.4	39	12.8	38	12.1
Disabled	No	446	67.6	221	67.6	225	67.6
	Yes	214	32.4	106	32.4	108	32.4

Number of students: 600

Source: UoS management information

In addition to the primary demographic variables, we also present the distribution by academic department within the respective schools. Academic department was the stratification variable used at the time of randomisation and stratified randomisation was conducted due to the anticipated risk of confounding effects arising from differing academic cultures, study routines, coursework and activities.

Table 31: Distribution by academic department

School	Department	Full		Treatment		Control	
		n	%	n	%	n	%
School of Digital, Technology, Innovation and Business (DTIB)	Comuting and Esports (COE)	158	6.9	81	7.1	77	6.8
	Creative Industries (CRI)	268	11.8	135	11.8	133	11.7
	Engineering (ENG)	109	4.8	52	4.6	57	5.0
	Staffordshire Games Institute (GMI)	511	22.4	257	22.5	254	22.3
	Institute of Business and Innovation (IBI)	104	4.6	50	4.4	54	4.7
	University of Staffordshire London (SUL)	118	5.2	59	5.2	59	5.2
Health, Education, Policing and Sciences (HEPS)	Allied Health (ALH)	151	6.6	78	6.8	73	6.4
	Institute of Education (IOE)	116	5.1	59	5.2	57	5.0
	Nursing and Midwifery (NUM)	315	13.8	157	13.8	158	13.9
	Psychology (PSY)	107	4.7	55	4.8	52	4.6
	Sport and Sciences (SAS)	149	6.5	71	6.2	78	6.9
	Social work, Law and Criminology (SLC)	171	7.5	86	7.5	85	7.5
Number of students: 2,277 Source: UoS management information							

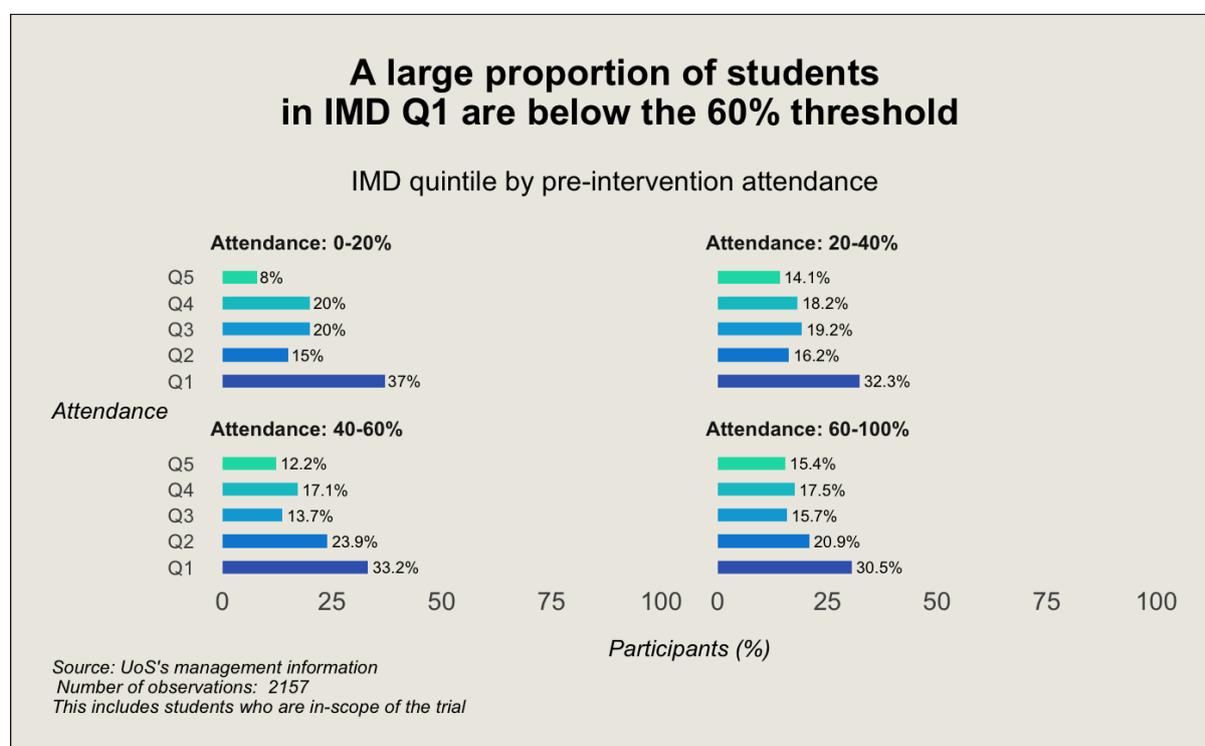
Table 31 demonstrates that, despite differences in the number of students across various academic departments, stratification has achieved a balanced distribution across the treatment and control groups; the distribution of the analytical sample by academic department is not presented due small numbers in certain departments but the distribution across the treatment and control group are fairly balanced. We also check the departmental distribution of the full randomised sample, as shown in Appendix D. While post-randomisation exclusions caused by some students being out-of-scope of the trial and slight imbalances in terms of gender, have led to slight deviations in this distribution, these are not substantial enough to affect the balance between groups, as confirmed by subsequent balance checks.

## Heterogeneity baseline analysis<sup>15</sup>

This section explores the relationship between attendance rates and key demographic characteristics, including socioeconomic background captured by IMD, gender and ethnicity for the randomised sample who were in-scope of the trial. The purpose of these visualisations is to determine whether variations in attendance are observed across different demographic sub-groups and to identify any underlying patterns that may be driving engagement with the push notification intervention.

In Figure 8, we can see that the proportion of students falling below the attendance threshold of 60% generally shows a declining trend across IMD quintiles. From this, it can be inferred that attendance rates improve as we move from the most deprived (Q1) to the least deprived (Q5) groups.

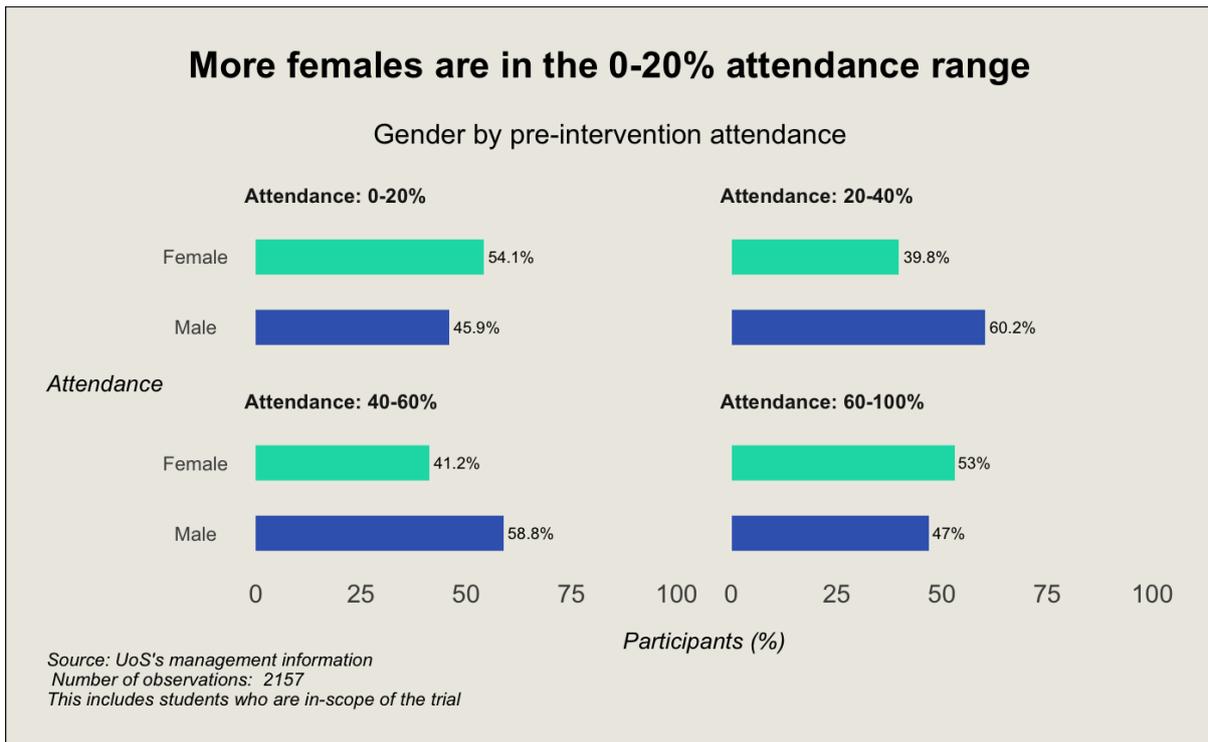
Figure 8: IMD quintiles by pre-intervention attendance



While the overall distribution of students across attendance bands appears broadly similar between male and female students, overall, the proportion of males is greater in the below 60% attendance groups.

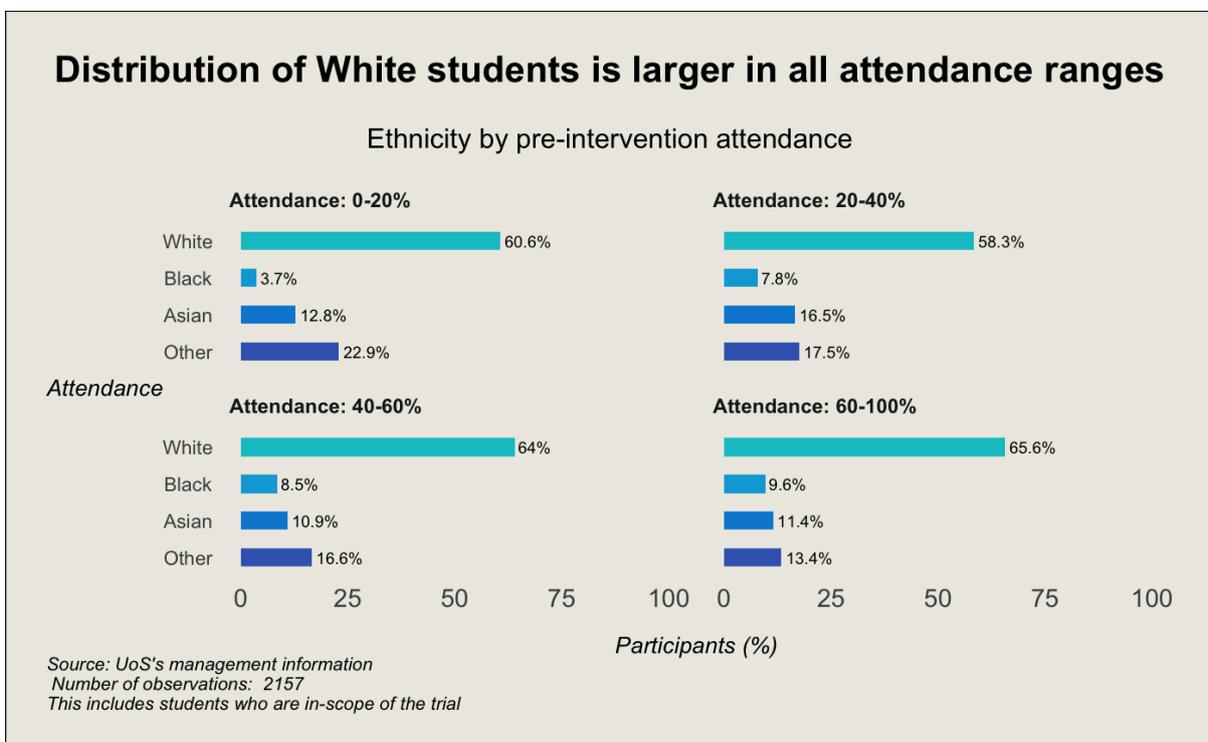
<sup>15</sup> Throughout this subsection, analysis has been done on the in-scope sample (first year, full-time).

Figure 9: Gender by pre-intervention attendance



In the case of ethnicity, within each of the lower attendance groups, the proportion of white students outnumber students in the other categories.

Figure 10: Ethnicity by pre-intervention attendance



## Pre/Post trends

Table 32 presents summary statistics of attendance levels before and after the intervention for the analytical and in-scope sample.

Table 32: Summary statistics of post-intervention attendance rates

Sample	Minimum	Median	Mean	Maximum	Standard Deviation	N
Analytical	0.00	67	61.03	100	32.85	660
	0.00	50	52.98	100	35.92	660
In-scope	0.00	100	82.35	100	31.96	2277
	0.00	83	73.45	100	31.96	2277

Mean and median attendance rates are lower for the analytical sample, as expected. This is consistent with its likely composition: primarily students with persistently low engagement. However, the full in-scope sample has a smaller standard deviation.

The density plots (see Figure 11 and Figure 12 for the analytical and in-scope samples respectively) present the pre- and post-intervention distributions. For those in the analytical sample, the distribution before and after the intervention changes considerably with the concentration of students in higher attendance band falls. Further, the peak of the graph shifts to the left indicating overall reduction in the attendance rates in the post-period.

On the other hand, the in-scope sample indicates that a segment of students with high pre-intervention attendance experienced particularly sharp declines, reducing the sample average. However, the modal attendance does not change considerably.

Figure 11: Density curve of pre- and post-intervention attendance rates for analytical sample

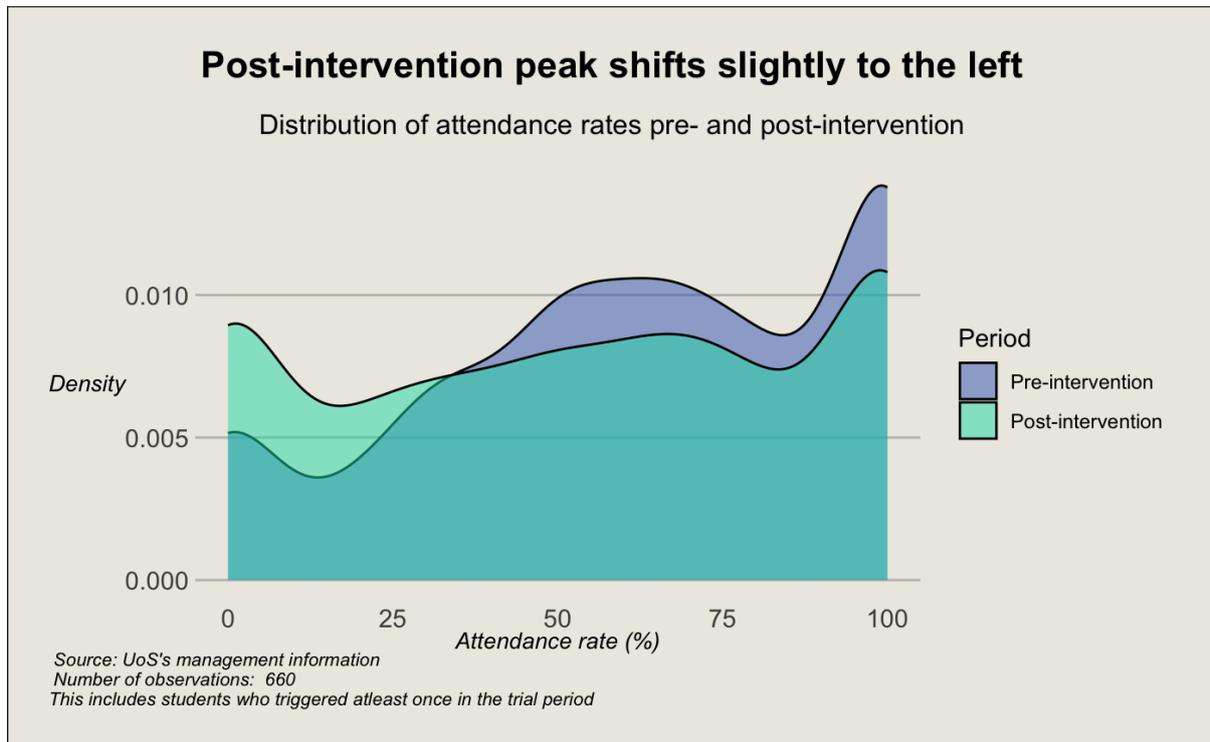
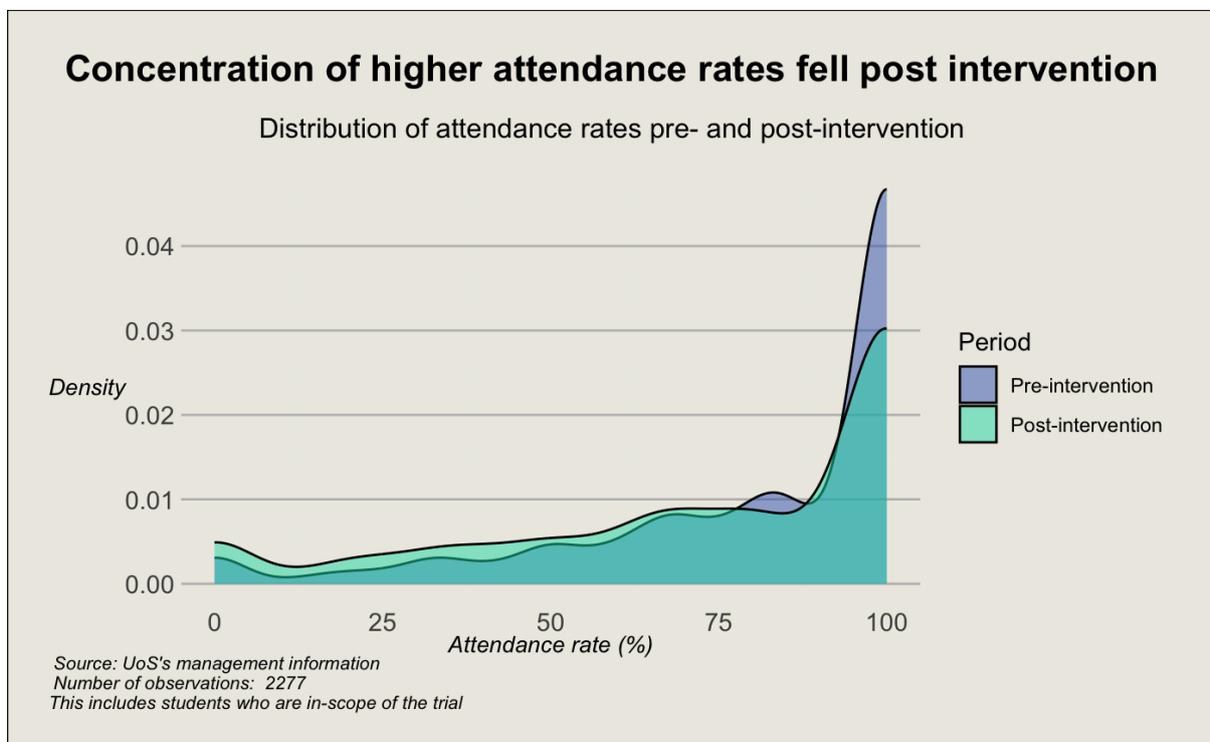


Figure 12: Density curve of pre- and post-intervention attendance rates for those in-scope of trial



## Appendix F: Regression tables for primary specification and robustness checks

Table 33: Blackboard logins (analytical sample)

	Model 1	Model 2	Model 3
(Intercept)	3.48 [ 2.59; 4.37]*	3.68 [ 2.17; 5.18]*	5.29 [ 4.84; 5.74]*
Treatment	0.16 [-0.49; 0.81]	0.12 [-0.49; 0.73]	0.21 [-0.44; 0.87]
Female	0.79 [ 0.14; 1.45]*	1.87 [ 1.16; 2.58]*	
Disabled=Yes	0.20 [-0.53; 0.93]	0.26 [-0.45; 0.96]	
Ethnicity=Black	0.81 [-0.50; 2.13]	0.34 [-0.84; 1.52]	
Ethnicity=Asian	0.28 [-0.61; 1.17]	-0.29 [-1.20; 0.63]	
Ethnicity=Other	0.90 [-0.11; 1.91]	0.14 [-0.90; 1.18]	
Mature=Yes		0.98 [ 0.22; 1.74]*	
Department=CRI		-3.32 [-4.67; -1.96]*	
Department=ENG		0.39 [-1.68; 2.47]	
Department=GMI		1.30 [-0.15; 2.75]	
Department=IBI		-0.94 [-2.36; 0.48]	
Department=SUL		1.06 [-2.15; 4.27]	
IMD=Q2		0.43 [-0.48; 1.34]	
IMD=Q3		-0.18 [-1.10; 0.74]	
IMD=Q4		0.24 [-0.72; 1.20]	
IMD=Q5		0.12 [-0.96; 1.19]	
Mean Attendance	0.02 [ 0.01; 0.03]*	0.02 [ 0.01; 0.03]*	
R <sup>2</sup>	0.04	0.21	0.00
Adj. R <sup>2</sup>	0.03	0.18	-0.00
Num. obs.	652	612	652
RMSE	4.22	3.88	4.28

\*\*\* p < 0.001; \*\* p < 0.01; \* p < 0.05; + p < 0.1. 95% confidence intervals provided in the brackets. Model 1 compares treatment group to control group. Covariates in model 1

include gender, disability status, ethnicity and mean attendance. 1. Regressions to conduct robustness checks in model 2 (additional covariates: mature student status, department and IMD Quintile) and model 3 (no covariates)

Table 34: Blackboard logins ( in-scope sample)

	Model 1	Model 2	Model 3
(Intercept)	2.68 [ 1.97; 3.38] *	3.78 [ 2.69; 4.88] *	7.74 [ 7.43; 8.05] *
Treatment	0.34 [-0.09; 0.77]	0.36 [-0.05; 0.77]	0.39 [-0.06; 0.84]
Female	0.58 [ 0.14; 1.01] *	1.52 [ 1.04; 2.00] *	
Disabled=Yes	0.35 [-0.15; 0.86]	0.21 [-0.28; 0.71]	
Ethnicity=Black	0.54 [-0.17; 1.25]	0.09 [-0.68; 0.85]	
Ethnicity=Asian	0.53 [-0.19; 1.25]	0.27 [-0.43; 0.96]	
Ethnicity=Other	0.60 [-0.04; 1.25]	0.53 [-0.13; 1.20]	
Mature=Yes		1.14 [ 0.58; 1.70] *	
Department=CRI		-5.27 [-6.27; -4.28] *	
Department=ENG		0.25 [-1.24; 1.74]	
Department=GMI		0.62 [-0.33; 1.57]	
Department=IBI		-2.62 [-4.02; -1.22] *	
Department=SUL		-0.82 [-2.03; 0.39]	
IMD=Q2		-0.22 [-0.80; 0.37]	
IMD=Q3		-0.08 [-0.74; 0.57]	
IMD=Q4		0.28 [-0.38; 0.95]	
IMD=Q5		0.41 [-0.25; 1.08]	
Mean Attendance	0.05 [ 0.05; 0.06] *	0.05 [ 0.04; 0.06] *	
R <sup>2</sup>	0.07	0.21	0.00
Adj. R <sup>2</sup>	0.07	0.20	0.00
Num. obs.	2263	2145	2263
RMSE	5.26	4.85	5.46

\*\*\* p < 0.001; \*\* p < 0.01; \* p < 0.05; + p<0.1. 95% confidence intervals provided in the brackets. Model 1 compares treatment group to control group. Covariates in model 1 include gender, disability status, ethnicity and mean attendance. 1. Regressions to conduct robustness checks in model 2 (additional covariates: mature student status, department and IMD Quintile) and model 3 (no covariates)

Table 35: Attendance rate (analytical sample)

	Model 1	Model 2	Model 3
(Intercept)	37.63 [ 29.62; 45.64]*	48.17 [ 34.71; 61.63]*	51.72 [47.87; 55.58]*
Treatment	1.76 [ -3.61; 7.14]	0.72 [ -4.54; 5.98]	2.55 [-2.95; 8.04]
Female	5.80 [ 0.36; 11.25]*	5.69 [ -0.07; 11.46]	
Disabled=Yes	-5.01 [-11.04; 1.01]	-2.20 [ -8.06; 3.66]	
Ethnicity=Black	0.64 [ -9.65; 10.94]	-1.58 [-11.98; 8.81]	
Ethnicity=Asian	1.48 [ -6.05; 9.01]	-2.36 [-10.53; 5.81]	
Ethnicity=Other	-5.10 [-12.84; 2.65]	-6.63 [-14.51; 1.25]	
Mature=Yes		-1.19 [ -7.67; 5.28]	
Department=CRI		-9.17 [-20.97; 2.63]	
Department=ENG		-18.09 [-35.08; -1.10]*	
Department=GMI		-20.85 [-32.79; -8.91]*	
Department=IBI		14.86 [ 2.00; 27.73]*	
Department=SUL		-12.23 [-34.55; 10.09]	
IMD=Q2		-4.26 [ -11.75; 3.23]	
IMD=Q3		-1.21 [ -9.35; 6.94]	
IMD=Q4		4.97 [ -3.21; 13.15]	
IMD=Q5		7.59 [ -1.24; 16.42]	
Mean Attendance	0.23 [ 0.14; 0.31]*	0.20 [ 0.11; 0.29]*	
R^2	0.06	0.20	0.00
Adj. R^2	0.05	0.17	-0.00
Num. obs.	660	619	660

	Model 1	Model 2	Model 3
RMSE	34.99	32.79	35.93

\*\*\*  $p < 0.001$ ; \*\*  $p < 0.01$ ; \*  $p < 0.05$ ; +  $p < 0.1$ . 95% confidence intervals provided in the brackets. Model 1 compares treatment group to control group. Covariates in model 1 include gender, disability status, ethnicity and mean attendance. 1. Regressions to conduct robustness checks in model 2 (additional covariates: mature student status, department and IMD Quintile) and model 3 (no covariates)

Table 36: Attendance rate (in-scope sample)

	Model 1	Model 2	Model 3
(Intercept)	32.89 [ 27.53; 38.24 ]*	37.16 [ 29.54; 44.78 ]*	72.80 [ 70.92; 74.69 ]*
Treatment	0.78 [ -1.59; 3.16 ]	0.55 [ -1.80; 2.91 ]	1.29 [ -1.34; 3.92 ]
Female	5.35 [ 2.96; 7.75 ]*	1.59 [ -1.31; 4.49 ]	
Disabled=Yes	-4.26 [ -7.10; -1.42 ]*	-2.17 [ -5.01; 0.67 ]	
Ethnicity=Black	2.20 [ -1.82; 6.21 ]	-2.40 [ -6.76; 1.97 ]	
Ethnicity=Asian	-3.92 [ -7.81; -0.02 ]*	-3.04 [ -7.14; 1.05 ]	
Ethnicity=Other	-4.61 [ -8.33; -0.89 ]*	-3.92 [ -7.87; 0.02 ]	
Mature=Yes		-1.17 [ -4.18; 1.84 ]	
Department=CRI		-2.66 [ -9.00; 3.67 ]	
Department=ENG		-3.80 [ -11.63; 4.04 ]	
Department=GMI		-7.23 [ -12.90; -1.56 ]*	
Department=IBI		9.25 [ 1.55; 16.96 ]*	
Department=SUL		2.33 [ -5.21; 9.87 ]	
IMD=Q2		-3.56 [ -7.05; -0.07 ]*	
IMD=Q3		-1.13 [ -4.90; 2.64 ]	
IMD=Q4		1.68 [ -1.95; 5.30 ]	
IMD=Q5		2.25 [ -1.68; 6.17 ]	
Mean Attendance	0.48 [ 0.43; 0.53 ]*	0.45 [ 0.40; 0.51 ]*	

	Model 1	Model 2	Model 3
R <sup>2</sup>	0.19	0.25	0.00
Adj. R <sup>2</sup>	0.19	0.24	-0.00
Num. obs.	2277	2157	2277
RMSE	28.81	27.80	31.96

\*\*\* p < 0.001; \*\* p < 0.01; \* p < 0.05; + p < 0.1. 95% confidence intervals provided in the brackets. Model 1 compares treatment group to control group. Covariates in model 1 include gender, disability status, ethnicity and mean attendance. 1. Regressions to conduct robustness checks in model 2 (additional covariates: mature student status, department and IMD Quintile) and model 3 (no covariates)

Table 37: Progression to tiered services (analytical sample)

	Model 1	Model 2	Model 3
(Intercept)	0.17 [ 0.10; 0.24]*	0.12 [ 0.02; 0.21]*	0.06 [0.03; 0.09]*
Treatment	0.05 [ 0.01; 0.09]*	0.06 [ 0.01; 0.10]*	0.04 [0.00; 0.09]*
Female	-0.03 [-0.07; 0.01]	-0.07 [-0.12; -0.02]*	
Disabled=Yes	0.02 [-0.03; 0.07]	0.00 [-0.04; 0.05]	
Ethnicity=Black	0.04 [-0.05; 0.13]	0.02 [-0.07; 0.10]	
Ethnicity=Asian	0.03 [-0.04; 0.09]	0.03 [-0.05; 0.12]	
Ethnicity=Other	-0.02 [-0.08; 0.03]	-0.01 [-0.06; 0.05]	
Mature=Yes		0.03 [-0.03; 0.09]	
Department=CRI		0.07 [-0.01; 0.15]	
Department=ENG		0.13 [-0.02; 0.29]	
Department=GMI		-0.00 [-0.08; 0.07]	
Department=IBI		0.06 [-0.03; 0.15]	
Department=SUL		0.10 [-0.10; 0.30]	
IMD=Q2		-0.01 [-0.07; 0.05]	
IMD=Q3		0.03 [-0.04; 0.10]	
IMD=Q4		-0.00 [-0.07; 0.06]	
IMD=Q5		0.00 [-0.07; 0.07]	
Mean Attendance	-0.00 [-0.00; -0.00]*	-0.00 [-0.00; -0.00]*	
R <sup>2</sup>	0.06	0.13	0.01
Adj. R <sup>2</sup>	0.05	0.09	0.00
Num. obs.	660	619	660
RMSE	0.27	0.26	0.27

\*\*\* p < 0.001; \*\* p < 0.01; \* p < 0.05; + p < 0.1. 95% confidence intervals provided in the brackets. Model 1 compares treatment group to control group. Covariates in model 1 include gender, disability status, ethnicity and mean attendance. 1. Regressions to conduct robustness checks in model 2 (additional covariates: mature student status, department and IMD Quintile) and model 3 (no covariates)

Table 38: Progression rate (in-scope sample)

	Model 1	Model 2	Model 3
(Intercept)	0.1603 [ 0.1139; 0.2068]*	0.1405 [ 0.0911; 0.1899]*	0.0211 [ 0.0127; 0.0295]*
Treatment	0.0110 [-0.0014; 0.0235]	0.0143 [ 0.0016; 0.0270]*	0.0096 [-0.0035; 0.0226]
Female	-0.0033 [-0.0162; 0.0097]	-0.0209 [-0.0369; -0.0049]*	
Disabled=Yes	0.0089 [-0.0068; 0.0245]	0.0049 [-0.0104; 0.0202]	
Ethnicity=Black	0.0113 [-0.0121; 0.0347]	0.0010 [-0.0240; 0.0260]	
Ethnicity=Asian	0.0170 [-0.0074; 0.0414]	0.0197 [-0.0086; 0.0480]	
Ethnicity=Other	-0.0119 [-0.0288; 0.0051]	-0.0099 [-0.0286; 0.0087]	
Mature=Yes		0.0142 [-0.0054; 0.0339]	
Department=CR I		0.0211 [-0.0075; 0.0498]	
Department=EN G		0.0329 [-0.0139; 0.0798]	
Department=GM I		0.0000 [-0.0210; 0.0211]	
Department=IBI		0.0358 [-0.0119; 0.0834]	
Department=SU L		0.0156 [-0.0159; 0.0472]	
IMD=Q2		-0.0049 [-0.0235; 0.0137]	
IMD=Q3		0.0044 [-0.0198; 0.0286]	
IMD=Q4		-0.0071 [-0.0264; 0.0122]	
IMD=Q5		-0.0035 [-0.0237; 0.0166]	
Mean Attendance	-0.0017 [-0.0022; -0.0012]*	-0.0017 [-0.0022; -0.0012]*	
R^2	0.0896	0.1143	0.0009
Adj. R^2	0.0868	0.1047	0.0005
Num. obs.	2277	2157	2277
RMSE	0.1519	0.1492	0.1589

\*\*\*  $p < 0.001$ ; \*\*  $p < 0.01$ ; \*  $p < 0.05$ ; +  $p < 0.1$ . 95% confidence intervals provided in the brackets. Model 1 compares treatment group to control group. Covariates in model 1 include gender, disability status, ethnicity and mean attendance. 1. Regressions to conduct robustness checks in model 2 (additional covariates: mature student status, department and IMD Quintile) and model 3 (no covariates)

Table 39: Access to support services (analytical sample)

	Model 1	Model 2	Model 3
(Intercept)	0.05 [ 0.01; 0.09]*	0.04 [ 0.00; 0.07]*	0.02 [ 0.01; 0.04]*
Treatment	-0.01[-0.03; 0.00]	-0.02 [-0.03; 0.00]	-0.01[-0.03; 0.00]
Female	-0.00[-0.02; 0.02]	-0.01[-0.03; 0.01]	
Disabled=Yes	0.00 [-0.02; 0.03]	0.00 [-0.02; 0.03]	
Ethnicity=Black	-0.02 [-0.03; -0.00]*	-0.02 [-0.04; -0.00]*	
Ethnicity=Asian	0.01[-0.03; 0.04]	0.01[-0.03; 0.04]	
Ethnicity=Other	-0.02 [-0.03; -0.01]*	-0.02 [-0.03; -0.00]*	
Mature=Yes		-0.00 [-0.03; 0.03]	
Department=CRI		0.02 [-0.00; 0.04]	
Department=ENG		0.08 [-0.02; 0.17]	
Department=GMI		-0.00 [-0.01; 0.01]	
Department=IBI		0.02 [-0.01; 0.05]	
IMD=Q2		-0.02 [-0.04; 0.00]	
IMD=Q3		0.00 [-0.03; 0.03]	
IMD=Q4		0.00 [-0.03; 0.03]	
IMD=Q5		-0.00 [-0.03; 0.03]	
Mean Attendance	-0.00 [-0.00; -0.00]*	-0.00 [-0.00; -0.00]*	
R^2	0.02	0.06	0.00
Adj. R^2	0.01	0.03	0.00
Num. obs.	660	619	660
RMSE	0.12	0.12	0.12

\*\*\* p < 0.001; \*\* p < 0.01; \* p < 0.05; + p<0.1. 95% confidence intervals provided in the brackets. Model 1 compares treatment group to control group. Covariates in model 1 include gender, disability status, ethnicity and mean attendance. 1. Regressions to conduct robustness checks in model 2 (additional covariates: mature student status, department and IMD Quintile) and model 3 (no covariates)

Table 40: Access to support services (in-scope sample)

	Model 1	Model 2	Model 3
(Intercept)	0.06 [ 0.02; 0.10]*	0.04 [-0.01; 0.09]	0.05 [ 0.04; 0.06]*
Treatment	-0.00 [-0.02; 0.01]	-0.00 [-0.02; 0.01]	-0.00 [-0.02; 0.01]
Female	0.02 [ 0.00; 0.04]*	0.01[-0.01; 0.04]	
Disabled=Yes	0.02 [ 0.00; 0.04]*	0.02 [-0.00; 0.04]	
Ethnicity=Black	0.04 [ 0.00; 0.08]*	0.03[-0.01; 0.07]	
Ethnicity=Asian	0.02 [-0.01; 0.05]	0.00 [-0.02; 0.03]	
Ethnicity=Other	0.03 [ 0.00; 0.06]*	0.03 [ 0.00; 0.07]*	
Mature=Yes		0.04 [ 0.01; 0.07]*	
Department=CRI		0.01[-0.02; 0.05]	
Department=ENG		0.06 [ 0.00; 0.13]*	
Department=GMI		0.00 [-0.03; 0.03]	
Department=IBI		0.02 [-0.03; 0.07]	
Department=SUL		-0.01[-0.04; 0.03]	
IMD=Q2		-0.02 [-0.05; 0.00]	
IMD=Q3		-0.01 [-0.04; 0.02]	
IMD=Q4		-0.01 [-0.04; 0.02]	
IMD=Q5		-0.02 [-0.05; 0.01]	
Mean Attendance	-0.00 [-0.00; -0.00]*	-0.00 [-0.00; 0.00]	
R^2	0.01	0.03	0.00
Adj. R^2	0.01	0.02	-0.00
Num. obs.	2277	2157	2277
RMSE	0.22	0.21	0.22

\*\*\* p < 0.001; \*\* p < 0.01; \* p < 0.05; + p<0.1. 95% confidence intervals provided in the brackets. Model 1 compares treatment group to control group. Covariates in model 1 include gender, disability status, ethnicity and mean attendance. 1. Regressions to conduct robustness checks in model 2 (additional covariates: mature student status, department and IMD Quintile) and model 3 (no covariates)

Table 41: Wellbeing scores (in-scope sample)

	Model 1	Model 2	Model 3
(Intercept)	2.78 [ 2.34; 3.21]*	2.88 [ 2.10; 3.67]*	3.33 [ 3.16; 3.51]*
Treatment	0.17 [-0.09; 0.44]	0.26 [-0.02; 0.54]	0.14 [-0.14; 0.42]
Female	0.27 [ 0.01; 0.52]*	0.18 [-0.14; 0.50]	
Disabled=Yes	-0.50 [-0.78; -0.22]*	-0.27 [-0.57; 0.03]	
Ethnicity=Black	-0.07 [-0.39; 0.24]	0.05 [-0.32; 0.41]	
Ethnicity=Asian	0.26 [-0.37; 0.88]	0.39 [-0.32; 1.11]	
Ethnicity=Other	-0.16 [-0.50; 0.17]	0.02 [-0.38; 0.41]	
Mature=Yes		0.22 [-0.11; 0.54]	
Department=CRI		-0.37 [-1.09; 0.34]	
Department=GMI		-0.17 [-0.70; 0.37]	
Department=IBI		-0.22 [-0.76; 0.32]	
IMD=Q2		-0.24 [-0.70; 0.21]	
IMD=Q3		-0.22 [-0.68; 0.23]	
IMD=Q4		-0.16 [-0.55; 0.24]	
IMD=Q5		0.18 [-0.24; 0.61]	
Mean Attendance	0.01 [ 0.00; 0.01]*	0.01 [-0.00; 0.01]	
R <sup>2</sup>	0.24	0.38	0.01
Adj. R <sup>2</sup>	0.18	0.17	-0.00
Num. obs.	93	89	93
RMSE	0.61	0.58	0.67

\*\*\* p < 0.001; \*\* p < 0.01; \* p < 0.05; + p<0.1. 95% confidence intervals provided in the brackets. Model 1 compares treatment group to control group. Covariates in model 1 include gender, disability status, ethnicity and mean attendance. 1. Regressions to conduct robustness checks in model 2 (additional covariates: mature student status, department and IMD Quintile) and model 3 (no covariates)

Table 42a: Heterogeneity analysis (outcome variable: VLE logins)

	Model 1	Model 2	Model 3	Model 4
Ethnicity = Asian	0.21 [-1.14; 1.55]			
Ethnicity = Black	-0.40 [-1.79; 0.98]			
Ethnicity = Mixed/Other/Unknown	-1.55 [-2.81; -0.29]*			
Mature = Yes		-0.08 [-1.08; 0.93]		
IMD = Q2			0.08 [-1.08; 1.24]	
IMD = Q3			0.32 [-0.98; 1.61]	
IMD = Q4			0.61 [-0.69; 1.90]	
IMD = Q5			1.24 [-0.04; 2.52]	
Dept=CRI				-0.09 [-2.08; 1.89]
Dept=ENG				-0.15 [-3.20; 2.90]
Dept=GMI				0.27 [-1.66; 2.21]
Dept=IBI				-1.04 [-3.78; 1.71]
Dept=SUL				-0.93 [-3.34; 1.48]
Dept=ALH				-0.17 [-2.67; 2.34]
Dept=IOE				0.90 [-1.20; 3.00]
Dept=NUM				0.48 [-1.65; 2.62]
Dept=PSY				-0.75 [-3.04; 1.55]
Dept=SAS				-1.32 [-3.69; 1.05]
Dept=SLC				0.10 [-2.08; 2.27]
R <sup>2</sup>	0.20	0.21	0.20	0.20
Adj. R <sup>2</sup>	0.19	0.20	0.19	0.19
Num. obs.	2145	2145	2145	2145
RMSE	4.86	4.85	4.87	4.87

Table 43b: Heterogeneity analysis (outcome variable: attendance)

	Ethnicity 1	Mature	IMD Quintile	Department
Ethnicity = Asian	-1.39 [ -9.13; 6.35]			
Ethnicity = Black	6.35 [ -1.16; 13.85]			
Ethnicity = Mixed/Other/Unknown	-4.61 [ -12.12; 2.90]			
Mature = Yes		6.02 [ 0.92; 11.12 ]*		
IMD = Q2			-5.70 [ -12.67; 1.28]	
IMD = Q3			-6.89 [ -14.13; 0.34]	
IMD = Q4			-8.65 [ -15.38; -1.92 ]*	
IMD = Q5			-2.90 [ -10.26; 4.45]	
Dept=CRI				0.08 [ -12.43; 12.60]
Dept=ENG				10.10 [ -5.54; 25.74]
Dept=GMI				2.88 [ -8.44; 14.20]
Dept=IBI				-0.62 [ -15.95; 14.72]
Dept=SUL				3.22 [ -11.80; 18.24]
Dept=ALH				2.23 [ -10.39; 14.84]
Dept=IOE				4.36 [ -9.78; 18.50]
Dept=NUM				4.03 [ -6.77; 14.82]
Dept=PSY				4.98 [ -9.64; 19.60]
Dept=SAS				-1.15 [ -14.33; 12.04]
Dept=SLC				-0.42 [ -14.30; 13.47]
R <sup>2</sup>	0.25	0.25	0.25	0.25
Adj. R <sup>2</sup>	0.24	0.24	0.24	0.24
Num. obs.	2157	2157	2157	2157
RMSE	27.78	27.77	27.77	27.84

\*\*\* p < 0.001; \*\* p < 0.01; \* p < 0.05; + p < 0.1. 95% confidence intervals provided in the brackets. Models compare treatment group to control group. Covariates include gender, disability status, ethnicity and mean attendance.

Table 44: Exploratory analysis assessing whether there are differential effects of the timing of when the students generated the low engagement trigger on VLE logins

	Model 1	Model 2	Model 3
(Intercept)	3.22 [ 1.96; 4.48 ]*	5.50 [ 3.08; 7.92 ]*	4.37 [ 1.55; 7.19 ]*
Treatment	0.19 [-0.90; 1.29]	0.03 [-1.37; 1.44]	0.19 [-0.79; 1.17]
Female	0.62 [-0.46; 1.69]	0.81 [-0.62; 2.24]	0.93 [-0.14; 1.99]
Disabled=Yes	0.83 [-0.35; 2.02]	-0.57 [-1.96; 0.81]	-0.34 [-1.55; 0.86]
Mean Attendance	0.03 [ 0.01; 0.05 ]*	-0.01 [-0.04; 0.02]	0.01 [-0.02; 0.04]
R <sup>2</sup>	0.05	0.01	0.02
Adj. R <sup>2</sup>	0.04	-0.02	0.00
Num. obs.	264	136	252
RMSE	4.50	4.18	3.94

\*\*\*  $p < 0.001$ ; \*\*  $p < 0.01$ ; \*  $p < 0.05$ ; +  $p < 0.1$ . 95% confidence intervals provided in the brackets. Models compare treatment group to control group. Covariates include gender, disability status, ethnicity and mean attendance.

Table 45: Exploratory analysis assessing whether there are differential effects of the timing of when the students generated the low engagement trigger on attendance

	Model 1	Model 2	Model 3
(Intercept)	31.86 [ 22.06; 41.66 ]*	77.91 [ 58.32; 97.50 ]*	44.67 [ 23.29; 66.05 ]*
Treatment	3.98 [ -4.69; 12.65 ]	-7.49 [-18.66; 3.68]	3.36 [ -4.80; 11.53 ]
Female	7.58 [ -1.21; 16.37 ]	-4.68 [-15.86; 6.50]	10.34 [ 1.93; 18.74 ]*
Disabled=Yes	-7.19 [-16.31; 1.93]	5.93 [ -5.93; 17.80 ]	-11.90 [-21.80; -2.00 ]*
Mean Attendance	0.25 [ 0.08; 0.42 ]*	-0.30 [ -0.55; -0.05 ]*	0.16 [ -0.08; 0.40 ]
R <sup>2</sup>	0.06	0.07	0.06
Adj. R <sup>2</sup>	0.05	0.04	0.04
Num. obs.	272	136	252
RMSE	36.16	33.43	32.67

\*\*\*  $p < 0.001$ ; \*\*  $p < 0.01$ ; \*  $p < 0.05$ ; +  $p < 0.1$ . 95% confidence intervals provided in the brackets. Models compare treatment group to control group. Covariates include gender, disability status, ethnicity and mean attendance.

## Appendix G: Further Analysis

### Compliance analysis

Per section 4.5, it was not possible to replicate the trigger rule for notifications that the student had average attendance of less than 60% in the two weeks preceding the push notification. Additionally, 158 students were missed being given the intervention in period two. Within the analytical sample (i.e. the sample where all treatment participants should have been notified at least once), this therefore results in one-sided non-compliance: no control participants were notified, but some treatment participants were not. Accordingly, a two-stage least squares model was carried out, with the following form:

$$D_i = \beta_1 Z_i + \gamma X_i + \epsilon_i \text{ (First stage)}$$

$$Y_i = \delta_1 \hat{D}_i + \gamma X_i + \epsilon_i \text{ (Second stage)}$$

Where  $Z_i$  refers to individual  $i$ 's treatment assignment,  $D_i$  refers to whether individual  $i$  received at least one notification, and other terms are as defined in Section 4.4.3.

Table 46 gives the results of this analysis.

Table 46: Compliance analysis

	(1) Blackboard logins	(2) Attendance
(Intercept)	-19.91* [-29.00; -9.83]	11.69 [-2.28; 25.66]
Treatment (ever notified)	-1.30 [-3.61; 1.01]	0.83 [-5.63; 7.28]
R <sup>2</sup>	-8.07	-0.08
Adj. R <sup>2</sup>	-8.17	-0.10
Num. obs.	651	660
RMSE	12.95	37.60

\*\*\* p < 0.001; \*\* p < 0.01; \* p < 0.05. Covariates include gender, ethnicity, disability status and the baseline of the outcome.

## Exploring if type of post-attendance outcome affects the results

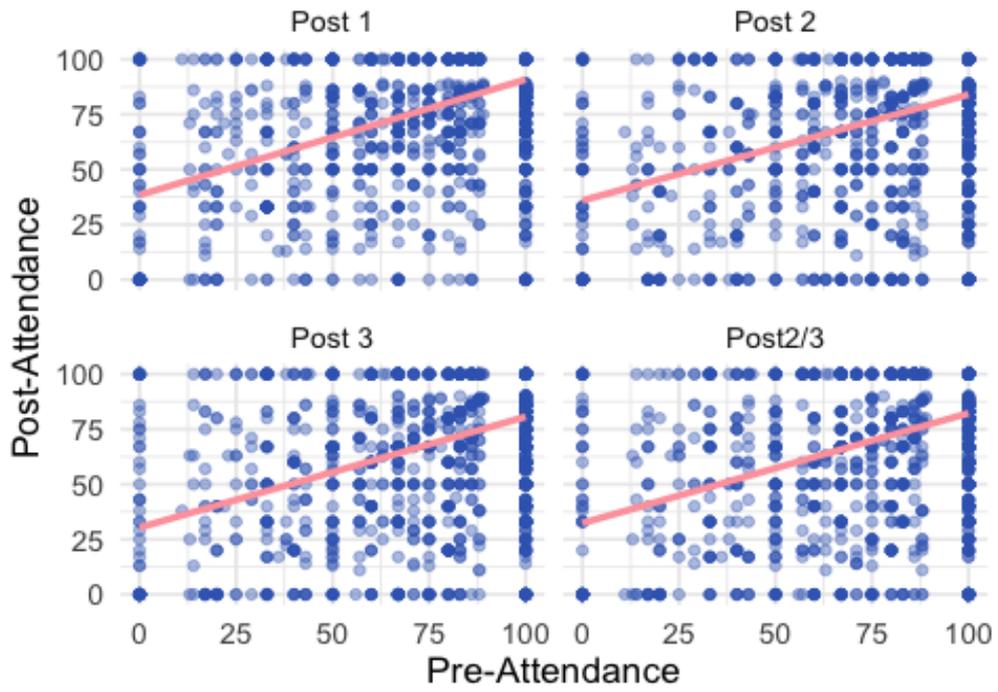
Since the interaction between treatment and post type is statistically insignificant, it suggests that the effect of the treatment does not change regardless of which post-intervention measure we use.

Table 47: Interaction of treatment with post-intervention attendance type

	Attendance
Intercept	40.46 (1.30) ***
Pre-intervention attendance	47.79 (1.18) ***
Treatment	1.01 (1.19)
Post2	-6.14 (1.19) ***
Post3	-9.93 (1.19) ***
Post2/3	-8.01 (1.19) ***
Treatment x Post2	0.21 (1.68)
Treatment x Post3	0.26 (1.68)
Treatment x Post2/3	-0.20 (1.68)
Num. obs.	9108
R <sup>2</sup> (full model)	0.17
Adj. R <sup>2</sup> (full model)	0.16

This can be further visualised through the graph below. The slopes of the scatter plot are visually similar, indicating that the strength and direction of association do not depend on which post measure is used. This supports the robustness of the results to alternative outcome definitions.

## Pre-Post Relationship Across Outcome Defin



## Balance checks on full randomised sample (including out of scope students)

Table 48: Summary of sample by department for full randomised sample (stratification variable)

School	Department	Full		Treatment		Control	
		n	%	n	%	n	%
School of Digital, Technology, Innovation and Business (DTIB)	Centre of Excellence (COE)	220	8.3	110	8.3	110	8.3
	Centre for Crime, Justice and Security (CRI)	288	10.8	144	10.8	144	10.9
	Engineering (ENG)	151	5.7	75	5.6	76	5.7
	Games, Media, and Interaction (GMI)	514	19.4	257	19.4	257	19.4
	International Business and Innovation (IBI)	182	6.9	91	6.9	91	6.9
	Staffordshire University London (UoSL)	119	4.5	59	4.4	60	4.5
Health, Education, Policing and Sciences (HEPS)	Applied Learning Hub (ALH)	158	6.0	79	5.9	79	6.0
	Institute of Education (IOE)	117	4.4	59	4.4	58	4.4
	Institute of Policing (IoP)(IOP)	50	1.9	25	1.9	25	1.9
	Nursing and Midwifery (NUM)	341	12.8	170	12.8	171	12.9
	Psychology (PSY)	137	5.2	69	5.2	68	5.1
	Student and Academic Services (SAS)	203	7.6	102	7.7	101	7.6
	Student Learning Centre (SLC)	175	6.6	88	6.6	87	6.6
Number of students: 2,655 Source: UoS's management information							

## Appendix H: Interview recruitment emails

Interview recruitment emails for students

2024/25

Dear [student name],

I hope this email finds you well.

I am writing to invite you to take part in an important research study exploring the effect of app-based wellbeing nudges prompted by learner analytics on higher education students' wellbeing, academic engagement and continuation.

The research will consist of an interview with a researcher involved in the project lasting [30-60] minutes on [date] and will be offering [£15 Amazon vouchers/incentive] as compensation for your time.

As a student who has received app wellbeing nudges, we need your perspective on 1) how well the nudges worked and what could be improved, and 2) whether it had an impact on your academic experience.

Your responses will be kept confidential, used solely for the purposes of this research, and your contributions will be anonymised in any reporting and presentation of the findings. You can find out more about the project [here](#).

If you would like to take part in the research, please provide your consent by completing the following [form] before [deadline].

Kind regards,

[Name]

Interview recruitment emails for staff

Dear [staff name],

I hope this email finds you well.

I am writing to invite you to take part in an important research study exploring the effect of app-based wellbeing nudges prompted by learner analytics on higher education students' wellbeing, academic engagement and continuation.

Following app wellbeing nudge trials, we need your perspective on 1) how well the nudge protocol worked and how it could be enhanced, 2) whether it had an impact on students' academic experience, and 3) how wellbeing nudges might be scaled up to support the whole student body in the long term.

The research will consist of an interview with a researcher involved in the project lasting [30-60] minutes on [date] and will be offering [incentive] as compensation for your time.

Your responses will be kept confidential, used solely for the purposes of this research, and your contributions will be anonymised in any reporting and presentation of the findings. You can find out more about the project [here](#).

If you would like to take part in the research, please provide your consent by completing the following [form] before [deadline].

Kind regards,

[Name]

## Appendix Hii: Informed Consent Statement

Student Interview informed consent

[Read out and linked in the chat, verbal consent recorded]

The purpose of this interview is to discuss the impact of using attendance monitoring to develop student engagement alerts. The session should last around 45 minutes. With your consent, we would like to record the discussion, so we can ensure an accurate representation of your discussion. Recordings will be deleted once the research is complete and your interview is transcribed.

Participation in this interview is voluntary and everything you say is confidential. You can withdraw part or whole of your contributions within 2 weeks, please contact the evaluation lead Vanessa Dodd, Head of Education Research and Evaluation, Staffordshire University at [vanessa.dodd@staffs.ac.uk](mailto:vanessa.dodd@staffs.ac.uk)

The findings of this research will be published as part of an implementation and process evaluation funded by TASO, the higher education 'what works' centre in the United Kingdom. Your responses are confidential and will be anonymised to protect your identity. Protecting your data is important to us and we take all necessary measures to ensure your data is not at risk in line with Staffordshire University's data protection policies: <https://www.staffs.ac.uk/legal/data-protection>.

This discussion helps us to understand what student engagement alerts using attendance monitoring is doing well and how it can improve, so your honest feedback as a participant is a vital part of the learning process. You will also each receive a £15 Amazon Voucher at the end of the interview as compensation for your time.

Although the purpose of this interview is solely to evaluate the student engagement alerts using attendance monitoring and questions are not designed to cover sensitive areas of discussion, if you do not wish to answer specific questions, you are under no obligation to do so. If you need support, please do make use of services available to you.

You can schedule an appointment with the Student Wellbeing team:  
<https://www.staffs.ac.uk/students/support/student-wellbeing-and-safeguarding/home>.

Below is a list of mental health and wellbeing support and services which are free to access.

SU (UoS) Student Wellbeing and Safeguarding

- Staffordshire University's Wellbeing and Safeguarding site offers both emergency and scheduled wellbeing appointments to support your mental health and wellbeing.
- <https://www.staffs.ac.uk/students/support/student-wellbeing-and-safeguarding/home>

#### NHS Mental health

- NHS support site dedicated to mental health.
- <https://www.nhs.uk/mental-health>

#### University Mental Health Advisers Network (UMHAN)

- UMAN is a national UK charity dedicated to providing support with mental health conditions.
- <https://www.umhan.com/>
- [info@umhan.com](mailto:info@umhan.com)

#### Student Minds

- A mental health charity dedicated to providing support to students.
- <https://www.studentminds.org.uk/>
- 0113 343 8440
- [info@studentminds.org.uk](mailto:info@studentminds.org.uk)

Do you have any questions?

If you are happy with everything we've discussed, can you all say or comment yes if you are happy to continue please?

Are you happy if I/we start recording now?

Staff Interview informed consent

The purpose of this interview is to evaluate the **implementation of wellbeing nudges prompted by learning analytics** at Staffordshire University. This [project is funded](#) by the Cabinet Office Evaluation Accelerator Fund (EAF) and managed by the higher education 'what works' centre TASO.

The interview will be undertaken by a trained interviewer should take **approximately 45 minutes** to complete. With your consent, we would like to record the discussion, so we can ensure an accurate representation of your discussion. Recordings will be deleted once the research is complete and your interview is transcribed.

As a member of staff involved in the implementation of the engagement and wellbeing nudge, your feedback helps us to understand how the intervention was implemented,

the experience of implementing the project and identify whether and how the intervention might be scaled or sustained over time.

The findings of this research will be published externally by TASO, the higher education 'what works' centre affiliate. Your responses are confidential, and the results of interview will be anonymised to protect your identity meaning we will not name you, your job title or any other possible identifying information in the report. We may directly quote you in the report as 'Staffordshire staff member.'

Protecting your data is important to us and we take all necessary measures to ensure your data is not at risk in line with Staffordshire University's data protection policies: <https://www.staffs.ac.uk/legal/data-protection>.

Participation in the interview is voluntary and you can withdraw your consent at any point during the interview. If you wish to withdraw your data after the interview you have up to two weeks to withdraw your consent and have your data excluded from analysis and reporting. We will not be able to exclude you from analysis after two weeks due to the quick timeline for reporting to our funders.

The purpose of this interview is to evaluate the implementation of the engagement and wellbeing nudges at Staffordshire University. The interview questions are not designed to cover sensitive areas of discussion; however you may refuse to answer specific questions if you do not wish to do so with no elaboration needed. If you need support, please do make use of services available to you.

**[Staffs staff only]** As a beneficiary of Staffordshire University Services, through the Help@Hand app you have access to a fully integrated Employee Assistance Programme (EAP), including a 24/7 helpline (08083 043 698) for emotional and practical support. Follow the steps on the Workvivo site to download the app if you have not done so: <https://workvivo.staffs.ac.uk/spaces/35005/pages/help-at-hand-sus-ltd-staff-only>.

You can also access free mental health services through NHS Mental health: <https://www.nhs.uk/mental-health>.

If you have any questions about the interview or how we protect your data, or would like to withdraw data submitted please email the Principal Investigator Vanessa Dodd, [vanessa.dodd@staffs.ac.uk](mailto:vanessa.dodd@staffs.ac.uk)

## Appendix Hiii: Participant semi-structured interview schedule

The impact of wellbeing nudges prompted by learning analytics

### **Staff**

Semi-structured interview schedule

This document is to be used by the researcher to support a 45 minute conversation with staff stakeholders which were developed to answer the implementation and process evaluation research questions. This is only a guide and researchers will be trained to in interview techniques to ensure robust data gathering.

Researchers will provide interview participants with informed consent in advance and will receive verbal consent if interview is conducted online. Verbal consent should be recorded.

[Ask if it is okay to record]

Tell me a bit about your role at Staffordshire University?

Tell me about your involvement in this project?

What was your experience [designing, implementing, supporting] the project?

Was the project implemented as intended?

What worked well?

What could be improved?

Do you think the project supported students?

In what ways?

How can we make sure this project is sustainable over time?

What types of changes are needed at Staffordshire to make sure projects like this are successful?

What alternatives are there that Staffordshire could consider supporting student engagement and success?

The impact of wellbeing nudges prompted by learning analytics

**Student**

Semi-structured interview schedule

This document is to be used by the researcher to support a 45 minute conversation with student stakeholders which were developed to answer the implementation and process evaluation research questions. This is only a guide and researchers will be trained to in interview techniques to ensure robust data gathering.

Researchers will provide interview participants with informed consent in advance and will receive verbal consent if interview is conducted online. Verbal consent should be recorded.

[Ask if it is okay to record]

Tell us a bit about you and the course you are studying.

What does good engagement with your course look like to you?

What was your initial reaction to receiving the push notifications on Beacon? [*students who received notifications only*]

Do you think Beacon notifications are helpful to keep you up to date with the University and your studies?

Did you receive a push notification to check your attendance?

What would a good attendance reminder look like?

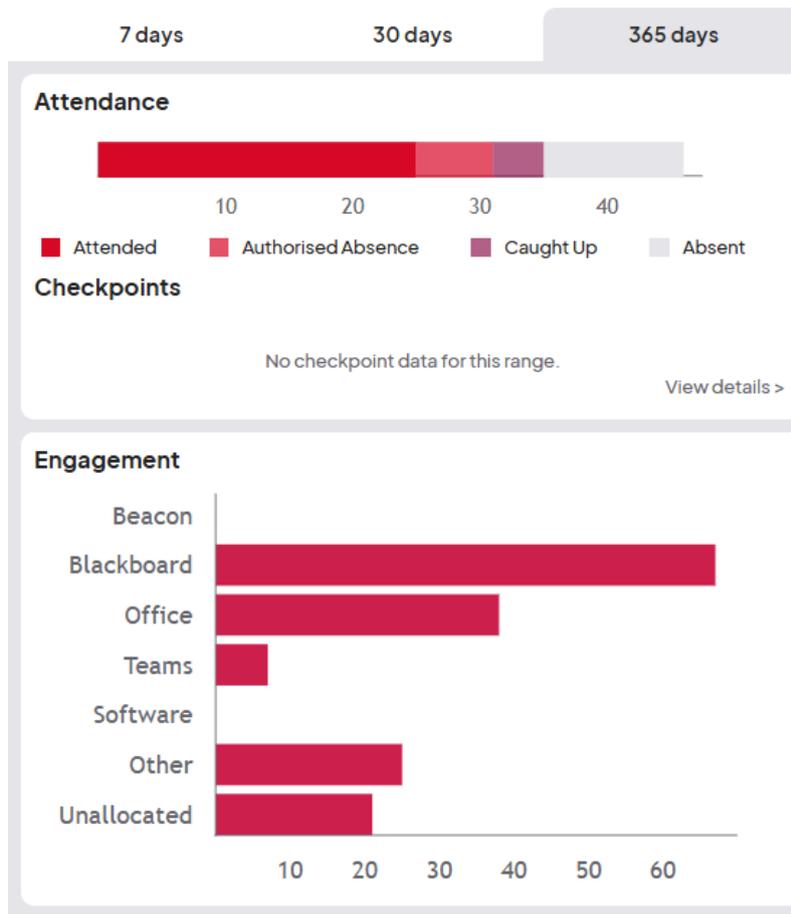
- What should we say?  
What support should we offer?

What is the right threshold for these notifications?

- How many classes should be missed?
- Over what period of time should students be absent prior to receiving a notification (7 day; 14 days)?

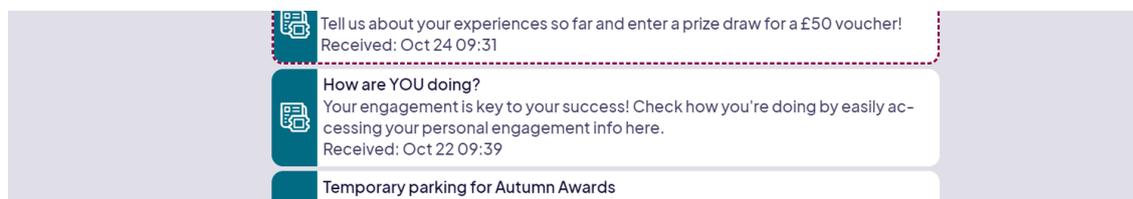
What other ways can we help support students to engage with their course?

## Appendix I: Attendance and engagement Beacon App tab

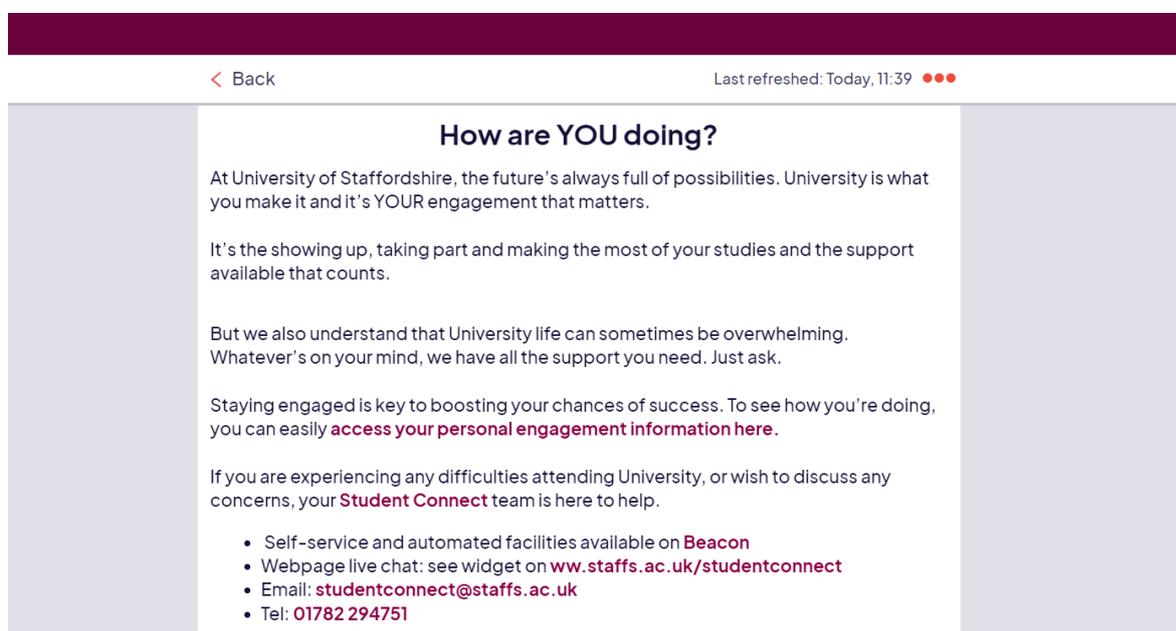


## Appendix J: Examples of application-based notification and personalised engagement dashboard

### Notification Header



### Notification



## Appendix K: Structured tiered BAU messages

Tier 1

RE: Are you ok DIANA ?



Student Connect

To [REDACTED]



Tue 23/01/2024 09:1



### HOW ARE YOU?

Hi Diana (Student Number: [REDACTED]),

We have noticed that you haven't checked in to any timetabled sessions or accessed your learning materials in Blackboard for a number of weeks and we just wanted to check in and see if you are ok.

Is there anything we should be aware of or do you need any support?

As you know, actively engaging in your course will provide the best opportunity for you to successfully progress in your studies, so please let us know if you need anything to help you get back on track.

Please find our contact details including email, live chat and phone below.

Kind Regards,

**Student Connect Team**  
Email: [studentconnect@staffs.ac.uk](mailto:studentconnect@staffs.ac.uk)  
Tel: 01782 29 4751

## Tier 2

From: Student Connect <[studentconnect@staffs.ac.uk](mailto:studentconnect@staffs.ac.uk)>  
Sent: Monday, March 11, 2024 10:23:50 PM  
Subject: We are worried about your engagement.



### ARE YOU OKAY ?

Hi,

We have noticed that you haven't checked into any of your timetabled sessions or accessed your learning materials in Blackboard for several weeks, and you didn't respond to our recent email.

We want to support you to re-engage with your course. Is there anything we should be aware of? Do you need any support? There is a lot of support available for you and we can help guide you to the help you need so please get in touch.

Please find our contact details including email, live chat and phone below so we can help you with your student journey.

Kind Regards,

## Tier 3

Report provided to relevant school for escalation