

Research protocol

Aston University - RCT of the STEM Progression Pathways programme

VERSION	DATE	REASON FOR REVISION/NOTES
<i>Any changes to the design to be agreed between the implementation partner(s), evaluator and TASO. Note any agreed changes in the table below.</i>		
1.1		
1.0 [original]	15/7/21	
Pre-registration		This design has been pre-registered on The Open Science (OSF) Framework . ¹

QA to be completed by Deputy Director, Academic Lead, or another individual nominated by them before project launch.

The QA rating system is based on Evaluation Security tool presented in the TASO Monitoring and Evaluation Framework.²

QA	Comments	Rating (out of 5)
Design	Straightforward 2-armed randomised controlled trial	5
Sample size	Between 110-150 estimated total sample for randomisation; a small but adequate sample, particularly given the intensity of the intervention	2
Outcome measure	Behavioural outcomes measures, supported by proxies and survey outcomes	5
Attrition	High potential attrition on proxy and survey outcomes; however, low attrition on behavioural outcomes which will be tracked via administrative data.	3.5
Validity	With the flexible pathway it may be harder to monitor engagement and track attendance; an implementation and process evaluation will be necessary to assess dosage and fidelity of intervention with this group	3
Overall		3.7

¹ <https://osf.io/75gpi>

² <https://taso.org.uk/evidence/evaluation/>

1. Summary

Background

TASO has funded Aston University (Aston) to participate in a project designed to help us understand evaluation of multi-intervention outreach programmes for widening participation at university.

Aims

This project concerns measuring the impact of different methods of delivering the Aston Pathway to STEM widening participation programme using a Randomised Controlled Trial (RCT).

Intervention

The primary aim of the Pathway to STEM programme is to encourage Y12 students from widening participation backgrounds in the Midlands area to consider studying a STEM subject at Aston University. The standard programme comprises an induction session, structured e-mentoring, subject taster days; careers advice sessions; UCAS personal statement day, summer school, and a graduation and celebration event. The flexible programme is similar but has no summer school, uses a student-demand-driven mentoring platform (unibuddy) and an online UCAS personal statement checking session.

Design

The trial is a two-armed RCT. One arm of the trial will be for the standard pathway programme (relatively high cost, capacity 80) and one arm of the trial for a flexible pathway programme (relatively low cost, demand expected to be within any reasonable capacity limit). Participants will be randomly allocated to the standard or flexible pathway subject to the constraint that the standard programme is filled to capacity.

Outcome measures

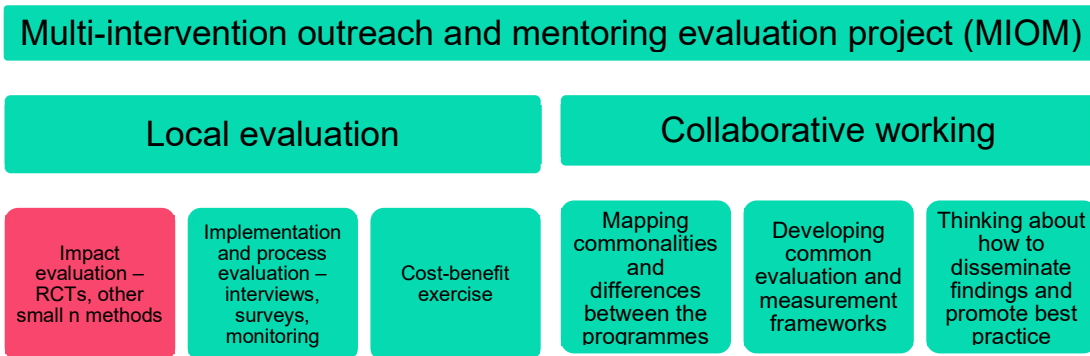
The primary outcome measure is whether a student enrolls in a STEM course in university at the academic year post programme (binary: Yes/No). Other outcome measures include whether a student enrolls in Higher Education (HE), the number of applications made and the number of offers received, self-reported knowledge/confidence in applying to and funding university, and their perception of belonging in HE.

Analyses

We will use multiple (logistic or linear) regression analysis to examine whether allocation to treatment has a positive impact on the dependent variables specified when controlling for a vector of demographic covariates.

2. Background

This Randomised Controlled Trial (RCT) is part of the TASO-funded project to develop our understanding of multi-intervention outreach and mentoring (MIOM) – that is, programmes which combine multiple outreach strategies into sustained support for learners over a course of months or years. The trial forms one part of a broader evaluation, as shown in the figure below. The parts of the figure which are not highlighted are covered in other planning documents.



The key stakeholders involved in the trial are outlined in the table below.

Organisation	Name	Role and responsibilities
Aston University	Liz Moores - Deputy Dean College of Health and Life Sciences	<ul style="list-style-type: none"> Principal Investigator
Aston University	Robert Summers - Research assistant	<ul style="list-style-type: none"> Research assistant Overseeing collection of data Data storage protocols (using HEAT³) Recording data on HEAT Evaluation plans
Aston University	Hope Nightingale - Acting HEAD of SRO	<ul style="list-style-type: none"> Running the Pathway to STEM programme (2020/1 academic year) Recording data on HEAT
Aston University	Tom Gregory - Outreach Manager	<ul style="list-style-type: none"> Running the Pathway to STEM programme (2020/1 academic year) Recording data on HEAT
Aston University	Sarah Fullwood - Pathways Manager	<ul style="list-style-type: none"> Running the Pathway to STEM programme (2021/2 academic year onwards)

³ The [Higher Education Access Tracker](#) (HEAT) works closely with government agencies such as the Office for Students (OfS), the Department for Education (DfE) and data custodians including the Higher Education Statistics Agency (HESA) to provide members with a broad range of services to help them monitor and evaluate outreach delivery.

		<ul style="list-style-type: none"> Recording data on HEAT
Aston University	Lydia Runham - Pathways Assistant (2021/2 academic year onwards)	<ul style="list-style-type: none"> Assisting Running the Pathway to STEM programme Recording data on HEAT
TASO	Eliza Kozman - Deputy Director of Research	<ul style="list-style-type: none"> Deputy Director of Research Quality assure the design and implementation of the trial from the TASO side.
TASO	Helen Lawson - Research Programme Manager	<ul style="list-style-type: none"> Research Programmes Manager Lead project management on the broader MIOM project
TASO	Rain Sherlock - Evaluation Manager	<ul style="list-style-type: none"> Evaluation Manager Oversee the design and implementation of the trial from the TASO side
TASO	Sarah Chappell - Senior Research Officer	<ul style="list-style-type: none"> Research Officer Support on design and implementation of trial from TASO side

3. Aims

The aim of widening participation is to increase higher education (HE) attendance among students from under-represented groups, such as those from areas with lower than average progression rates to HE or individuals who would be first in their family to attend. One approach is the use of multi-intervention outreach which combines multiple outreach activities into a sustained programme of support for learners. These programmes typically include components such as mentoring, summer schools, campus visits, subject taster sessions, and information, advice and guidance (IAG) workshops.

A recent literature review into the evidence base of UK widening participation activities has identified multi-intervention outreach as among one of the most common approaches used by HE providers (Education Policy Institute, 2019). While the review found evidence that these programmes are associated with positive outcomes for participants (see for example Chilosi et al, 2010; Emmerson et al, 2005, Kettlewell & Aston, 2012), the literature has two key limitations. First, most of the existing evidence is focused on whether these programmes impact student aspirations/attitudes rather than long-term behavioural outcomes such as HE attendance. Second, due to the methodologies used, the current literature provides correlational and contextual evidence on the efficacy of these programmes, particularly in a UK context.

Multi-intervention outreach is a resource-intensive activity and requires significant investment of time and effort from HE providers and students alike. Therefore, there is a need to establish clear causal evidence on the efficacy of this approach. To this end, we plan to measure the efficacy of the standard Science, Technology, Engineering and Mathematics (STEM) Progression Pathways programme via a pilot randomised controlled trial (RCT). The primary aim of this trial is to investigate whether a widening participation programme with activities that are delivered live (in-person/online) – the *standard* programme – have greater benefit in getting students to enrol at university than a *flexible* programme which aims to deliver similar information, advice and guidance to the standard programme but some of it is delivered asynchronously (e.g. information packs, pre-recorded talks, etc.). Some of the events are shared between the programmes.

The specific hypotheses for this study are:

- H1: A greater proportion of students on the *standard* programme than on the *flexible* programme will progress to a STEM course at HE in the year following the programme.
- H2: A greater proportion of students on the *standard* programme than on the *flexible* programme will progress to HE in the year following the programme.
- H3: Students on the *standard* programme will make more applications to study at university than students on the flexible programme.
- H4: Students on the *standard* programme will receive more offers to study at university than students on the flexible programme.
- H5: Students who attend more pathway (and non-pathway) events during the programme are more likely to enrol in Higher Education.
- H6: At the end of the programme students report greater confidence that they can make a successful application to university.
- H7: At the end of the programme students report greater confidence that they know how to fund university.
- H8: At the end of the programme students report greater belief that university is a place for them.

As the study is a pilot RCT, the research aims above are accompanied by a series of pilot objectives outlining the insight we hope to gain in order to assess the feasibility of running a full efficacy trial with future cohorts. The list of pilot objectives can be found in [Annex 5](#).

4. Intervention

A broad outline of the interventions in each of the programmes for 2020/21 pathway entry is in the table below with more detail concerning the aims and activities of each event in [Annex 2](#). In addition to the events listed here students will also be encouraged to attend other non-pathway events run by the outreach team (e.g., additional masterclasses and IAG sessions) and where possible attendance at these events will be recorded.

Date	Standard Programme	Flexible Programme	Year group
Jan – Mar 2021	Recruitment		Y12
April 2021	Live launch event + Study Skills Session	Introduction	Y12
August 2021	Summer school (*)	Subject taster day (*)	Y12
Aug 2021 – January 2022	Structured e-mentoring (*)	Access to Unibuddy (until July 2022)	Y12
September 2021	UCAS and personal statement day (*)	Online personal statement checking (*)	Y13
January 2022	Contextual offer (if applicable)		Y13
February 2022	Study skills conference (*)		Y13
July 2022	Graduation event & transition support		Y13
September 2022	Continued support		Y13

(*) = core event – students must attend all core events on their programme to be eligible for a contextual offer.

5. Design

We will run a pilot RCT to determine the impact of the standard STEM programme, when compared to the flexible STEM programme. We will randomly allocate places on the standard and flexible programme to students from the pool of eligible applicants, subject to a capacity limit of 80 on the standard programme.

Once a pool of eligible students has been identified, these individuals will be randomly allocated into two groups: those who get a place on the standard programme (the ‘treatment’ group) and those who get a place on the flexible programme because there is not capacity for everyone to attend the standard programme (the ‘control’ group). The size of the two groups will depend on the level of oversubscription but all of the STEM Progression Pathway programme places will be filled.

The randomised design allows us to compare the outcomes of students in the treatment group with those of students in the control group so we can provide a robust causal estimate of the effect of the standard programme.

6. Outcome measures

The outcome measures for this trial have been selected based on the Theory of Change presented in [Annex 1](#) and on recent research (Burgess, Moores and Horton, under review) that found the more learners engaged with a multi-intervention outreach programme (UniConnect) the greater were their chances of enrolment on HE courses; though the benefits of additional engagement beyond five or six activities was minimal. Given that the main aim of the programme is to increase progression to universities, this guides our choice of primary outcome measure.

Outcome measure	Data to be collected	Point of collection
PRIMARY: Enrolment of Students at university on STEM course	UCAS entry data from HESA. Aggregated data can be obtained from UCAS strobe service.	Via HESA data: collected via the HEAT tracking service (Spring of the academic year they begin)
PRIMARY: Enrolment of Students at university		Via UCAS Strobe: October of the year they enter HE
SECONDARY: Number of applications to HE	Aggregated data can be obtained from UCAS strobe service.	Via UCAS Strobe: October of the year they enter HE
SECONDARY: Number of offers	Individual data relies on asking the students.	From February prior to university entry.
SECONDARY: Number of pathway (and non-pathway) events attended	Attendance lists	At each event
SECONDARY: Self-reported knowledge of and confidence in the ability to apply to university	Scores on the following survey questions. How confident are you that...? <ul style="list-style-type: none"> ● you know how to apply to university ● you could make a successful application to university ● you could make a successful application to 	Milestone surveys carried out at three times during the programme <ol style="list-style-type: none"> 1. Beginning, 2. Post Personal-Statement event, 3. Post pathway programme

	study a STEM subject at university	
SECONDARY: Self-reported knowledge of and confidence in the ability to fund university	Scores on the following survey questions. How much do you know about...? <ul style="list-style-type: none"> • how to fund university How confident are you that...? <ul style="list-style-type: none"> • you can afford to go to university. 	Milestone surveys carried out at three times during the programme <ol style="list-style-type: none"> 1. Beginning, 2. Post Personal-Statement event, 3. Post pathway programme.
SECONDARY: Self-reported belonging in HE	Scores on the following survey questions. How much do you agree with the following statements? <ul style="list-style-type: none"> • I would enjoy university • University is for people like me 	Milestone surveys carried out at three times during the programme <ol style="list-style-type: none"> 1. Beginning, 2. Post Personal-Statement event, 3. Post pathway programme.

7. Sample selection

Description of study settings

A mixture of live online and campus-based activities (COVID permitting and dependent on group allocation).

Participants will be applicants to the STEM Progression Pathways programme. Therefore, the inclusion criteria for this research are simply the eligibility criteria for the programme.

Inclusion criteria (2020/1 pathway entry) [Note criteria are subject to change in subsequent years]

1. Year 12 students:
 - a. who are not part of another Aston University widening participation programme, **and**
 - b. are studying at a school or college in the Midlands, **and**
 - c. have attained at least 5 GCSEs at grade 4 or above in Maths, English and Science, **and**
 - d. whose predicted grades at A Level/BTEC/IB would also match the entry requirements of their chosen course at Aston University.
2. **And** meet at least one of the following widening-participation criteria:

- a. Live in a POLAR4, Quintile 1 or 2 area, **or**
- b. Attend a school or college in a POLAR 4, Quintile 1 or 2 area, **or**
- c. Come from a home where neither parent has attended a university in the UK or abroad, **or**
- d. Have a disability or are in receipt of a personal independence payment, **or**
- e. Are in care or have been in care in the past.

Expected sample size and rationale for this number

Sample size is expected to be between 110 and 150 based on historic data. There will be 80 on the standard programme and between 30 and 70 on the flexible programme.

Strong links with partner schools and communications via email and social media will ensure that the sample size can be achieved.

8. Randomisation

Allocation to each version of the Pathway to STEM will be by pseudo-random number generation using code developed in R by Eliza Kozman and modified by Robert Summers.

Blinding to group allocation will not be possible either for the students or researchers due to the unequal sample size and the way students will receive the intervention.

Balance of the allocation will be assessed (e.g. demographics/prior attainment etc.). Methods of analyses that account for any differences at baseline will be used. These baseline differences are sex, ethnicity, family history of HE and prior attainment (mean GCSE/BTEC results).

9. Data collection

Student data will be provided by an online application form. Checks are made on this data at the point of application to ensure dates-of-birth are in the expected range. This data is directly uploaded to HEAT to avoid copy/paste errors.

Student data will be stored on HEAT. HEAT contains an automatic check for student records that are potential duplicates.

Data is stored on encrypted local devices, encrypted cloud services, secure network drives or secure web services with strictly limited access.

To indicate that they accept their place on the programme students will complete a milestone survey ([Annex 3](#)) conducted via HEAT which provides us with baseline attitude/intention data. Where students respond multiple times to the survey only the last complete response will be used. The validity of these surveys is currently untested.

Students will complete a further milestone survey after the UCAS personal statement event during October.

Students will complete a (modified) milestone survey some point after UCAS applications close. The survey has to be modified to adjust questions that are no longer relevant regarding, e.g., students' attitudes to applying to university.

Each event will be followed by a survey that will report how students perceive the aims of the event were met.

Participant retention is encouraged through a contextual offer scheme open to students who complete the pathways programme (i.e., students who have attended all the core events on their pathway). As of 2020 contextual offers at Aston are made by giving students offers two grades lower than the standard offer (by course), e.g. BBB becomes BCC.

Milestone survey response rates will be improved either by

1. Making them part of the registration for an activity, **or**
2. An entry into a prize draw (currently £100 vouchers).

Data item	Timeframe	Collector
Demographic Data <ul style="list-style-type: none"> • Sex • Family history of HE • KS4 grades • Ethnicity 	Application (January-March 2021)	Application form
Milestone Survey 1	Prior to launch events (April 14 th 2021 for the standard programme and April 28 th 2021 for the flexible programme)	Robert Summers
Milestone Survey 2	Post UCAS personal statement day (October 2021)	Robert Summers
Milestone Survey 3	Post UCAS applications/Pre A-Level exams (TBC: April 2022)	Robert Summers
Attainment data (from students)	Post A-level results (August 2022)	Robert Summers
Participation in additional outreach activity data	Post UCAS applications/Pre A-Level exams (TBC: April 2022)	Robert Summers
Destination data either from UCAS Strobe service (aggregated), HESA, or from students themselves	October 2022 (Strobe) Spring 2023 (HESA)	Robert Summers
Dates for data collection of the second STEM pathway cohort are TBC but can assumed to be 12 months later.		

10. Procedure

Timeframe	Action
March 2021	(2020/1 cohort) Randomisation of eligible STEM pathway students to standard/flexible arms
March/April 2021	(2020/1 cohort) Milestone survey 1
October 2021	(2020/1 cohort) Milestone survey 2
February-June 2022	(2020/1 cohort) Final milestone survey
February-June 2022	(2020/1 cohort) Selection of individuals from milestone survey for focus groups/one-to-one interviews
March 2022	(2021/2 cohort) Randomisation of eligible STEM pathway students to standard/flexible arms
March/April 2022	(2021/2 cohort) Milestone survey 1
August 2022-Spring 2023	(2020/1 cohort) Destination data gathering
September/October 2022	(2021/2 cohort) Milestone survey 2
February-June 2023	(2021/2 cohort) Final milestone survey
February-June 2022	(2021/2 cohort) Selection of individuals from milestone survey for focus groups/one-to-one interviews
August 2023-Spring 2024	(2021/2 cohort) Destination data gathering



11. Power calculations

Our assumptions are:

- Significance level: 0.05
- Power: 0.8
- 70% of initial sample remains at end of cycle
- 80% of the standard group enter higher education

Sample size	Size of treatment group	Size of comparat or group	MDES
114	80	34	With the assumptions and a sample size of 114 the smallest effect size (Cohen's h) that can be detected is 0.69. The proportion in the flexible group would have to be below 48% in order for us to detect it. Such an effect is equivalent to the standard programme leading to 19 extra students entering university.

228

160

68

If the programme was evaluated over two years with the same level of recruitment and apportioning to standard and flexible groups (total sample = 228) then the smallest effect size (Cohen's h) that can be detected is 0.49.

The proportion in the control group would have to be below 58% in order for us to detect it. Such an effect is equivalent to the standard programme leading to 25 extra students entering university.

As this is a pilot trial, it is not powered to 0.8 (80%) - the typical threshold for a well powered study. We run 'pilot studies', powered to 0.5 (50%), to determine evidence of promise. Although a significant effect in a pilot study is not sufficient evidence that the intervention works, it may suggest that the intervention 'shows promise' but that further research is required. In general, if we have little existing evidence about the efficacy of an intervention, and we can run a pilot trial powered at the 50% threshold, it may be worth running an underpowered RCT for evidence of promise.

12. Analytical strategy

○ Specified Analyses (H1-H5)

The primary outcome measures, progression to a STEM-related HE course (H1) and progression to HE (H2), are binary and will be analysed using mixed-effects binary logistic regression. For mixed effects logistic regression our model will be:

$$\log\left(\frac{P(Y_{ij} = 1)}{P(Y_{ij} = 0)}\right) = \alpha + \beta_0 T_{ij} + \sum_k \beta_k X_{kij} + \mu_j$$

Where:

- Y_{ij} is whether or not the i -th student in school j enrolled at university (in a STEM-related course) (1) or did not enrol at university (0).
- $P(Y_{ij} = x)$ is the probability that $Y_{ij} = x$ where $x = 0$ or 1.
- T_{ij} is a treatment indicator, set to 1 for participants in the standard group and 0 for those in the flexible group
- X_{kij} is a vector of k demographic covariates (Sex, Family history of HE, Mean KS4 grades ([Annex 4](#)), Ethnicity).
- μ_j represents each school as a random effect in the model thus allowing a different intercept to be fitted for each participant's school.

This can be implemented in R using the function `glmer` from the package `lme4` in the following manner:

For outcomes H3 (number of applications) and H4 (number of offers) we will use mixed effects linear regression where

$$N_{ij} = \alpha + \beta_0 T_{ij} + \sum_k \beta_k X_{kij} + \mu_j$$

Where N_{ij} is the number of applications (H3) or offers (H4) the i -th student in school j received, and the remaining terms are as above.

For H5 (number of events attended) an additional term in the logistic model will be added that is the number of pathway and non-pathway events that the student has attended.

13. Ethical considerations

The study has received a positive decision from Aston University’s Ethics Board. Participants were randomly allocated to each group, and, in comparison with previous years all students are on a pathway. While the hypotheses concern the superior effectiveness of the standard programme, we also anticipate that the flexible programme will have a positive impact. Furthermore, all students who complete either programme will be eligible for a contextual offer.

14. Risks

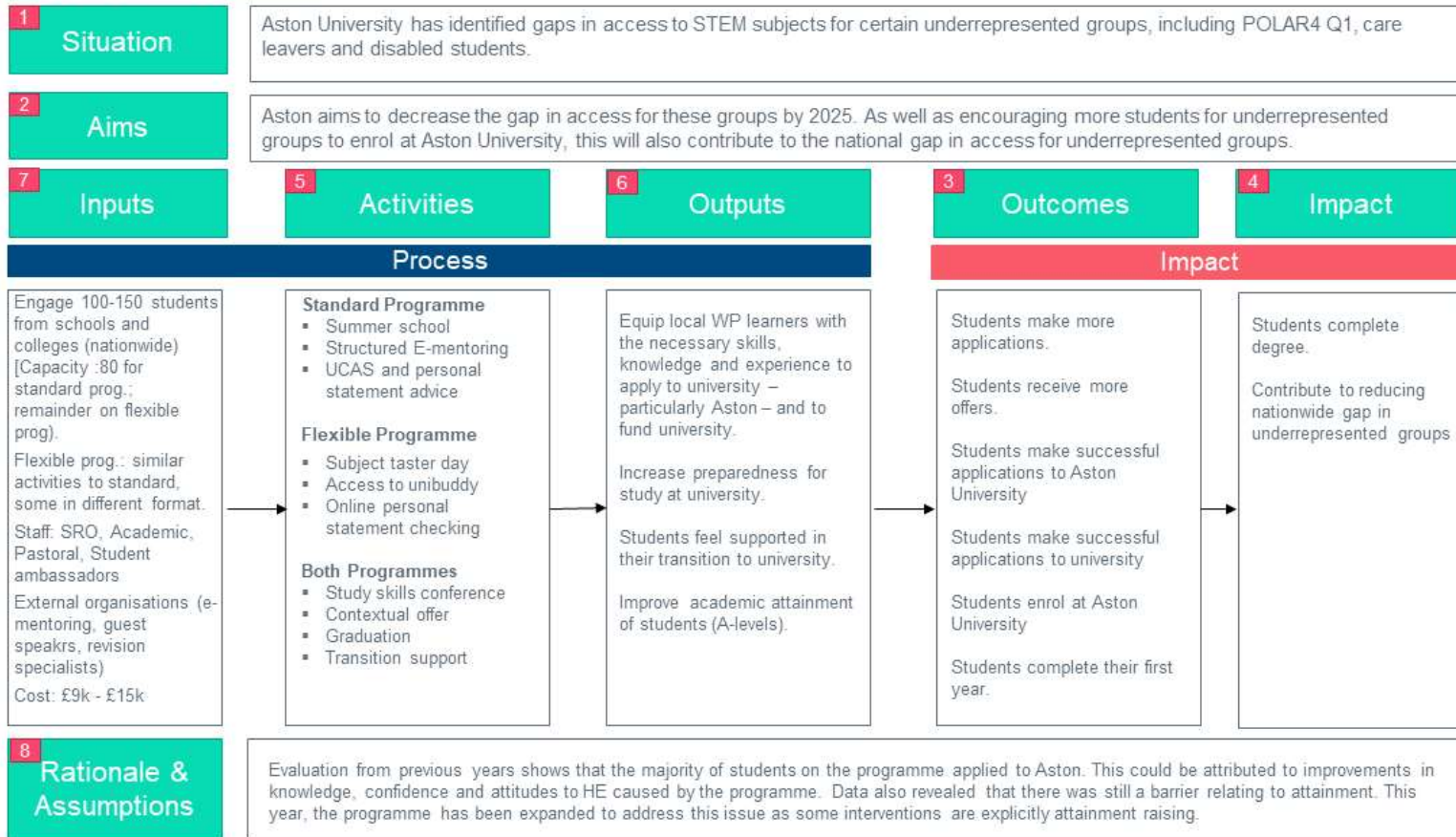
Part of evaluation	Risk	Mitigation strategy	Risk owner
Programme	Uneven attrition levels between flexible and standard groups, perhaps, for example, it is easier to stick with the flexible pathway.	Similar efforts are put into advertising and encouraging attendance at events on both pathways.	Aston University
Programme	Difficulty obtaining accurate attendance data at online events	Participants reminded to use their real name when attending online events. Participants encouraged to fill out an online attendance register during the event.	Aston University

15. References

Burgess, A. P., Moores, E., & Horton, M. (2021, under review) Optimising the impact of a multi-intervention outreach programme on progression to Higher Education: recommendations for future practice and research

- Chilosi, D., Noble, M., Broadhead, P., & Wilkinson, M. (2010). Measuring the effect of Aimhigher on schooling attainment and higher education applications and entries. *Journal of Further and Higher Education*, 34(1), 1–10
- Emmerson, C., Frayne, C., McNally, S., & Silva, O. (2005). Evaluation of Aimhigher: Excellence Challenge. The early impact of Aimhigher: Excellence Challenge on pre-16 outcomes: An economic evaluation. DfES Publications
- Kettlewell, K. and Aston, H. (2012). Realising Opportunities Evaluation: Cohort 2 Final Report – July 2012. Slough: NFER.

16. Annex 1: STEM Pathway Theory of Change



17. Annex 2: STEM events programme (2020/21 cohort)

Standard programme

Date	Event	Details
April 2021	Live launch event + Study Skills Session	<p>The pathway launches with a welcome from the Student Recruitment and Outreach team who will give an overview and introduction to the whole programme. Elevate education will then deliver a session called “Study Sensai”.</p> <p>We address the question: “What is study?” This seminar breaks down the study techniques of the top students, providing students with a road-map for what work they need to be doing across the year and how to do it.</p>
August 2021	Summer school	<p>As part of the programme learners will attend a 3-day virtual summer school. This will comprise of social and academic tasks for the learners in attendance. The learners will work on a subject specific task which they will work on throughout the summer school, as well as taster sessions led by student ambassadors. On top of this, there will be various IAG talks from the SRO team on topics such as Student Finance as well as sessions from support services from across the university. Each day will also give the learners opportunities to interact with other learners on the programme in the form of quizzes and social activities.</p>
Aug 2021 – January 2022	Structured e-mentoring	<p>Learners on the programme will be paired with a current Aston undergraduate student who is study a course in the area they are interested in. Using the Brightside mentoring platform, the mentors and mentees will follow a guided mentoring programme, designed to ensure that learners are provided with information, advice and guidance to help them make decisions about their next steps.</p>
September 2021	UCAS and personal statement day	<p>Advice and guidance will be offered around personal statements through a presentation and 1-1 run throughs for personal statement drafts. Advice will also be provided around how the application system works and what students can expect on their journey to university.</p>

February 2022	Study skills conference	<p>Learners will be invited onto campus for a day focused on equipping them with the right skills to help them revise for their upcoming exams. Elevate education will deliver “Ace your Exams” and the “Finishing Line”.</p> <p>Ace your exams</p> <p>With the arrival of exams, knowing the material is no longer enough. It now becomes a case of application. The question for many students is: “How do I take all the work I have done and turn it into the marks I deserve?” This seminar outlines the critical exam skills that will allow them to excel in the exam room, whilst also demonstrating that exams are not just about the exam room- the preparation is where the marks are.</p> <p>The Finishing line</p> <p>The end is in sight. The last thing we want now is students stressing and forgetting the skills they’ve been taught over the previous few years. This seminar is the conclusion to the programme and is designed to reinvigorate students as they approach the end of year 13. Students are provided with a clear road map for the final few months and practical strategies to manage the pressure and stress that comes with it!</p>
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Flexible Programme

Date	Event	Details
April 2021	Launch	The pathway launches with a welcome from the Student Recruitment and Outreach team who will give an overview and introduction to the whole programme.
August 2021	Subject taster day	These subject tasters will enable student to get more of an insight into how each subject is taught at Aston, as well as what they can expect to learn on the course.
Aug 2021 – July 2022	Access to Unibuddy	Learners will have access to the Unibuddy Mentoring platform. On here, they can ask direct questions to the students registered on there around subjects they are studying. They can also

		ask general questions to the Student Recruitment and Outreach team.
September 2021	Online personal statement checking	The Student Recruitment and Outreach team will deliver a 45-minute webinar on the application process and personal statement to learners. At the end of the session, they will be invited to send in their drafts of their personal statement to the team for individual feedback.
February 2022	Study skills conference	(see standard programme)

18. Annex 3: Milestone survey questions

Preamble	Statement
How much do you know about...?	the benefits of university
How much do you know about...?	the range of courses available at university
How much do you know about...?	the range of STEM courses available at university
How much do you know about...?	the different routes into university
How much do you know about...?	how to fund university
How much do you know about...?	the options available to me if I choose not to go to university
How confident are you that...?	you can afford to go to university
How confident are you that...?	you know how to apply to university?
How aware are you about...?	which university courses interest me
How aware are you about...?	which university courses I can do with my current subject choices
How aware are you about...?	where I could find out more about university
How likely are you to...?	apply to university
How likely are you to...?	apply to study a STEM subject at university
How confident are you that...?	you could make a successful application to university
How confident are you that...?	you could make a successful application to study a STEM subject at university
How confident are you that...?	you could succeed at university
How much do you know about...?	the extra-curricular opportunities available at university
How much do you know about...?	the social and networking opportunities available at university
How much do you agree with the following statement?	I would enjoy university
How much do you agree with the following statement?	university is for people like me

19. Annex 4: Calculation of mean KS4 grade

Students' mean grade will be computed from the mean GCSE grade (1-9). The grades from other level 2 qualifications (e.g., BTEC, OCR, iGCSE, GCE/O-level) will be converted to GCSE grades using the following table (adapted from Cambridge, BTEC and Pearson):

New GCSE Grade	Old GCSE grade iGCSE grade GCE O-level	Other level 2 qualification (e.g., BTEC, OCR)
9	A*	Distinction*
8		
7	A	Distinction
6	B	Merit
5		
4	C	Pass

Other level 2 grades that cover 2 of the numeric GCSE grades are taken as the average of the two (e.g., GCSE A* or Distinction* is counted as 8.5).

20. Annex 5: Pilot study objectives

The following table has been used to consider what we want to get out of a pilot study.⁴

Main Reason	Examples
Process: This assesses the feasibility of the processes that are key to the success of the main study	<ul style="list-style-type: none"> ● Assess opt out rates (Currently zero) ● Recruitment rates – high enough for RCT? ● Difficulties taking into account requirements of WP team and using eligibility criteria? <ul style="list-style-type: none"> ○ Criteria can be widened if required. ● Attendance rates at events <ul style="list-style-type: none"> ○ Generally higher for online events which tend to be shorter and require travel. ○ Participants must attend >80% of events in year 1 to progress to year 2 of the programme. ● Demographics of those who apply <ul style="list-style-type: none"> ○ Representative of those schools overall? ○ Dependent on pathway (STEM/Medicine/Law/Business)? ● Length of time to fill out all the study forms <ul style="list-style-type: none"> ○ There are issues with the sheer volume of evaluations related to each event.

⁴ Table taken from Thabane, L., Ma, J., Chu, R., Cheng, J., Ismaila, A., Rios, L. P., ... & Goldsmith, C. H. (2010). A tutorial on pilot studies: the what, why and how. *BMC medical research methodology*, 10(1), 1.

	<ul style="list-style-type: none"> ○ Will students suffer from survey-fatigue? – though for milestone surveys this might be mitigated by inducements (e.g., £100 prizes). ● Understanding of study questionnaires or data collection tools: Do subjects provide no answer, multiple answers, qualified answers, or unanticipated answers to study questions?
<p>Resources: This deals with assessing time and resource problems that can occur during the main study</p>	<ul style="list-style-type: none"> ● Is the equipment readily available when and where it is needed? <ul style="list-style-type: none"> ○ Particular issue for online delivery as ~10% participants have poor technology access. ○ Support offered, e.g. internet dongle, tablet. ● Survey tools <ul style="list-style-type: none"> ○ Vevox <ul style="list-style-type: none"> ▪ Great for ensuring good response rates during an event. ▪ Doesn't integrate with HEAT. ▪ Can Vevox responses be uploaded to HEAT and attached to individuals? ▪ Recording identifiable information whilst respecting privacy is difficult. ○ HEAT survey tool <ul style="list-style-type: none"> ▪ Buggy and not as user-friendly as Vevox. ▪ Directly integrated with HEAT. ▪ Great for milestone surveys where identifiable information and responses from the control group are required.
<p>Management: This covers potential human and data management problems</p>	<ul style="list-style-type: none"> ● Are there any problems entering data into the computer? <ul style="list-style-type: none"> ○ Recording of 1-to-1 sessions with HEAT is cumbersome particularly if we want to be able to report on it. ○ How to code intensity of event ○ Engagement of student ○ Intended outcomes ● Can data coming from different sources be matched? <ul style="list-style-type: none"> ○ Some data matching for non-HEAT sources is possible where participants are asked to report first three letters of first name and last 2 letters of postcode. ● Do data show too much or too little variability? <ul style="list-style-type: none"> ○ Issues around survey responses where a high percentage of responses are already "Strongly Agree"

	<p>to an attitude that we're hoping to influence. We'll struggle to be able to measure a positive change here.</p>
<p>Scientific: This deals with the assessment of treatment safety, dose, response, effect and variance of the effect</p>	<ul style="list-style-type: none"> ● Survival analysis <ul style="list-style-type: none"> ○ At what point do students drop out of the pathway? ○ Do those students still go to university? ● Number of offers and applications <ul style="list-style-type: none"> ○ UCAS data though they are unwilling/unable to share this. ○ May need to gather via a survey around "pathway graduation time". ● Investigate the fidelity of intervention delivery <ul style="list-style-type: none"> ○ Was the intervention delivered as intended? ○ Break down the intervention into parts and code each event in terms of the outputs they are supposed to achieve vs the outputs reported by the students. <ul style="list-style-type: none"> ▪ For each output was that part of the intervention delivered ▪ Did the delivered parts have the specified output? ● Improvements in student attainment <ul style="list-style-type: none"> ○ Current situation regarding COVID means improvements (or otherwise) in A-level results may be difficult to disentangle from issues around time in school and curriculum covered across schools. ● If all events are virtual then certain aspects of the programme intended to for example, raise aspirations, may not have the desired effect if they're being delivered to someone's bedroom!