TASO Transforming Access and Student Outcomes in Higher Education

Research protocol

Online Teaching & Learning in the time of COVID-19

VERSION	DATE	REASON FOR REVISION/NOTES
Any changes to the design to be agreed between the implementation partner(s), evaluator and TASO. Note any agreed changes in the table below.		
1.2	March 2022	Updated by Paul Adams
1.1	January 2022	Updated by Paul Adams
1.0 [*original*]	July 2021	Rain Sherlock
Pre-registration		This design has been pre-registered on the Open Science Framework (OFS) registry.[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 the Evaluation Security tool presented in the TASO Monitoring and Evaluation Framework.[2]

QA	Comments	Rating (out of 5)
Design	Some further clarity needed on nature of design. Because protocol is not necessarily meant for correlational analysis, discussion of 'treatment' could potentially be confusing to a non-specialist audience Some further consideration required also around how the different teaching/assessment modes/types are codified (with specification required now that data is available)	3

[1] https://osf.io/6425a

[2] https://taso.org.uk/evidence/evaluation/

	Suggested analyses mostly appropriate, but some inconsistency in the specified focus of the work which is reflected in the modelling approach (comments below)	
Sample size	Appropriate given constraints but given that only one HEP, limited external validity.	4
Outcome measure	Appropriate for focus of work but with uncertainty around how it has been captured (which can be solved with information about second attempts, for instance)	4
Attrition	Not relevant in the sense of 'trial attrition', but relatively high levels (23%) of missing data on some variables – the proposed solution is appropriate, but there isn't information on missing data on the outcome variables yet, so this will be important to include	4
Validity	Limited external validity but high internal consistency	4
Overall	**Further clarity and consistency required on research design and associated analytical method**	**3.75**

1. Summary

Background

TASO's Board of Trustees have asked that TASO conduct a short research project to understand the impact of the COVID-19 pandemic on disadvantaged learners.

Aims

This project aims to improve our understanding of how the teaching and assessment methods during the COVID-19 pandemic has affected the awarding gap between disadvantaged learners and their peers in Higher Education.

Intervention

The intervention we are testing is the teaching and assessment methods made during the COVID-19 pandemic. We will use the actual methods that a single Higher Education Provider made from 2018/19 to 2020/21. These methods and changes to them through the pandemic are not randomised.

Design

Descriptive, correlation and regression analysis of secondary data from one HEP will be used to understand how the COVID-19 pandemic has affected the awarding gap between disadvantaged learners and their peers. This is not a causal evaluation, and so caution should be taken in inferring policy conclusions from this analysis. It will provide indicative information about the relationships between different teaching and assessment approaches used during COVID-19, and learner outcomes.

Outcome measures

The primary outcome measure is student attainment (unadjusted course and module grades). The secondary outcome measure is whether a student progressed into the next year of their course.

Analyses

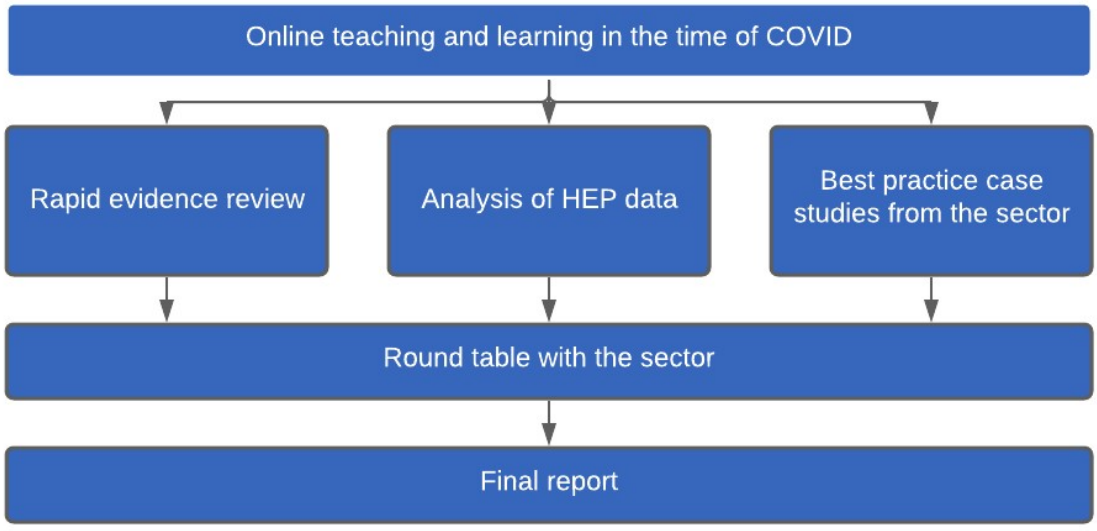
We will use regression analysis to examine whether disadvantaged students are positively or negatively affected (in terms of module grades or progression) by the teaching and assessment methods used during the COVID-19 pandemic. We will do this by interacting the variables for teaching and assessment methods with the variables identifying disadvantaged students.

2. Background

Education in the UK has been severely disrupted by the COVID-19 pandemic. When the pandemic hit in March 2020, Higher Education Providers (HEPs) were forced to deliver their content online with minimal time to prepare. In the 2020/2021 academic year, HE providers had more time to plan for a blended approach to teaching, including both online and face-to-face elements. Due to this planning time, there is likely more variation across faculties and providers than there was during the immediate response to the pandemic, providing an opportunity to investigate how different teaching methods have affected the educational attainment of disadvantaged learners.

During the initial scoping and planning phase of this project, HEPs indicated a range of differing views on how the pandemic has impacted the awarding gap that already exists between disadvantaged learners and their peers. Some HEPs hold the view that moving to online teaching and learning has benefited disadvantaged learners, while others indicate that the switch to online learning may widen the existing awarding gap. This project aims to use existing data and case studies from HEPs across the sector to investigate the impact of pandemic on disadvantaged learners and the current awarding gap.

As shown in the figure below, the project will involve three main components: a rapid evidence review; descriptive statistical analysis of course data provided by an HEP; and examples of evaluation best practice from across the sector. Each of these components sit side-by-side and will contribute to a round table where we discuss the emerging findings from the interim project, before publishing the final report.



The key stakeholders are involved in the research project are outlined in the table below:

Organisation	Name	Role and responsibilities
PABE	Paul Adams	- Research Analyst
TASO	Rain Sherlock	- Evaluation Manager - TASO project lead
TASO	Jessica Hunt	- Head of Research (maternity cover) - TASO strategic direction and project oversight
TASO	Zahra Boudalaoui-Buresi	- Research Officer - Research support

3. Aims

Research aim: This project aims to improve our understanding of how the COVID-19 pandemic has affected the awarding gap between disadvantaged learners and their peers.

Primary research question: When pure face-to-face learning and assessment is not possible, what are the best teaching and assessment methods to minimise equality gaps?

We are interested in the response of different HE providers this academic year, including:

- how online delivery has been incorporated into face-to-face course delivery,
- the extent to which providers have made use of synchronous versus asynchronous learning, and
- how examinations/assessments have changed or been adapted in response to the COVID-19 pandemic.

HEPs have indicated a range of differing views on how the pandemic has impacted the awarding gap that already exists between disadvantaged learners and their peers. By analysing the data from a single provider, TASO hopes to explore the impact of the pandemic, and the changes to teaching and learning, on disadvantaged learners and increase our understanding of the best way to deliver remote/blended learning so the awarding gap is minimised.

This is an exploratory study using historical data, and discussions with HEPs have provided conflicting views on the effects of teaching choices on learner outcomes. We therefore do not have any prior hypothesis on the direction or size of relationship between teaching and assessment choices, learner outcomes and the awarding gap.

4. Intervention

The intervention for this project will be the teaching delivery and student assessment methods on individual modules across different faculties. The HEP that has shared data for this project will be using their own codified list of teaching and assessment methods, which TASO will use to create a codified list.

We explore the following teaching and assessment methods that the HEP used throughout 2018/19, 2019/20 and 2020/21:

- Teaching Type (Lecture vs tutorials/workshop/seminars vs other)
- Teaching Mode (F2F vs Online)
- Teaching Timing (Asynchronous vs Synchronous)

- Assessment Type (Coursework vs Exam vs other)
- Assessment Mode (F2F or online)

5. Design

For the data analysis phase of this project, we will use descriptive analysis of secondary data from one HEP to understand how the COVID-19 pandemic has affected the awarding gap between disadvantaged learners and their peers. As we are using descriptive analysis, we will not be able to infer generalisable recommendations based on the findings. Nevertheless, we hope the analysis will help us to better understand the relationship between teaching and assessment methods and modes, and outcomes.

Upon compiling the anonymised secondary data into one data set, we will codify the teaching and assessment methods, prior to running regression analysis.

Firstly, we will compare attainment and progression between disadvantaged learners and their peers for each of the different teaching and assessment methods. A series of comparison graphs will be produced. The characteristics of disadvantage that we will include in the analysis are:

- IMD decile 1-3
- POLAR4 quintile 1-2
- Bursary eligibility

We will also compare attainment and progression between different modules using different teaching and assessment methods, using a range of demographic characteristics:-

- Gender
- Ethnicity
- Whether or not the student has a disability
- Whether or not the student is a mature student
- Accommodation status during term time (student halls, private rented, living at home)

Next, we will use OLS and logistic regression to observe how demographic and disadvantage characteristics (independent variables) predict attainment and progression (dependent variables), and how this varies depending on the different teaching and assessment methods chosen by the HEP. It is important to note that, as the students have not been randomised into the intervention - different teaching and assessment methods - we will not be able to estimate any causal relationship between the teaching and assessment methods used and the outcomes observed. However, we will include multiple observable variables (demographic and disadvantage characteristics) that will help us understand how the pandemic, and move to online

teaching and learning, has affected the awarding gap between disadvantaged learners and their peers.

6. Outcome measures

Outcome measure	Data to be collected	Point of collection
PRIMARY: Attainment	Pre-adjusted module marks and course/year marks as collected by HEPS. The data includes first attempt resits for those students who chose to defer their exam (but not those who resit due to failing the first exam). To be coded into categories: ● Below 40 = Fail ● 40-49 = Third-Class Honours Third (3rd) ● 50-59 = Lower Second-Class Honours (2:2) ● 60-69 = Upper Second-Class Honours (2:1) ● 70 or above = First-Class Honours (1st)	HEPs collect this data for the students enrolled on their courses and will be sharing the anonymised data with TASO
SECONDARY: Progression to next year of HE course	Whether a student progressed to the next year of their course (binary: yes/no)	HEPs collect this data for the students enrolled on their courses and will be sharing the anonymised data with TASO

7. Sample selection

Participants will be students on courses delivered by one HEP who have agreed to take part in this research project. For the HEP to share course data with us, the course must have at least 50 students enrolled and of these students, 20% must be from a disadvantaged background to maintain a representative sample. We include students who have taken a first attempt resit (that is they deferred their exam to a later sitting). We do not include second attempt resits.

The provider will share student data, including attainment and progression data. We will also collect detailed information on teaching and assessment methods used during the

pandemic including the use of synchronous and asynchronous delivery, and the use of online and face-to-face delivery.

8. Data collection

All student data has already been collected and is part of the partner provider's institutional datasets. The data will be anonymous as there will be no identifiable markers in it (e.g. names). TASO has completed a data anonymisation balancing check and the HEP has signed a checklist, alongside the Data Sharing Agreement, qualifying that they have aggregated the data to ensure it is anonymous prior to sharing it with TASO. We will also apply disclosure and rounding checks to any reports as a final check to ensure the anonymity of participants. Data has been transferred between the partner and TASO using Egress, an email security service that allows data to be protected when being shared by email.

Data item	Use	Collector
Course details (e.g. subject, level)	Covariates for analysis	Partner higher education providers
Year of study		
Ethnicity		
Gender		
Disability		
POLAR quintile		
IMD decile		
Bursary eligibility		
Mature student status		
Students term-time accommodation (student halls, private rented, living at home)		
The grades/qualifications the students entered HE with		
The teaching choices made during the pandemic	Intervention data	

(synchronous vs asynchronous etc.)		Partner higher education providers
The timing of the changes to course delivery		
The assessment methods used (coursework, online exams etc.)		
Attainment data (module and course grades)	Outcome data	Partner higher education providers
Progression data (whether the student progressed to the next year of study)		

9. Procedure

A high-level project timeline is given in the table below.

Timeframe	Action
February - March 2021	• Research design developed • Recruitment of partner providers • Data sharing agreements made
April - June 2021	• Rapid evidence review
June - July 2021	• HEPs collating data • Develop open call for best practice case studies from the sector
July - August 2021	• Launch open call for best practice • Collect data from HEPs
September - October 2021	• Data analysis - delay waiting for updated data • Shortlist best practice case studies
December 2021 - January 2022	• Data analysis continued
February 2022	• Analysis report due
March 2022	• Launch final report • Round table with the sector

10. Analytical strategy

Primary outcome analysis

The primary outcome for student attainment is unadjusted module and course marks for each student. Our preferred approach is to conduct multiple regression analysis to find the relationships between teaching choices and learner outcomes. We provide a step by step approach to this below:

1. Codify all teaching and assessment methods used during the period. For each module and year combination this creates a set of dummy or categorical variables which reflect the teaching and assessment methods of that module in that year. Following inspection of the HEP data, intervention variables include:
    - Teaching Type (Lecture vs tutorials/workshop/seminars vs other)
    - Teaching Mode (F2F vs Online)
    - Teaching Timing (Asynchronous vs Synchronous)
    - Assessment Type (Coursework vs Exam vs other)
    - Assessment Mode (F2F or online)
    - Assessment Timing (Asynchronous vs Synchronous)

    For each of the teaching and assessment methods, the HEP lists three to four different types for each module. For example, it could be that a module is taught via lectures, seminars, and a workshop. Or that a module is assessed based on an essay, an exam and a multiple-choice test. These appear as three different teaching or assessment types in our data.

    For teaching methods, whether it is listed as 1, 2 or 3 depends on the proportion of hours that is spent on that teaching type, with the higher proportions coming first. For assessment methods, whether it is listed as 1, 2 or 3 depends on the timing in the year when the assessment takes place (even if later assessment methods actually have a higher share in the overall module mark.

    We label these as primary, secondary and tertiary (and in some cases quaternary) types.

2. For each teaching method the HEP provides the number of hours for each teaching method during the module. For assessment methods, the HEP provides the share of that assessment method in the overall module grade. We can use this as a measure of intensity for each of the teaching and assessment methods.
    - Assessment Share (proportion of grade for each assessment type)
    - Teaching Hours (the number of hours in the module of that teaching type)

3. For 2019 specifically, we observe two teaching variables for the same year – one pre-COVID, which covers 80% of the university term, and one post-COVID which

covers the remainder. However we only have a single outcome variable for that year. We therefore need to combine the pre and post COVID variables so that we can include a single set of 2019 teaching and assessment choices in the database. Our approach is pragmatic and involves the following sequential allocation process:

- If a teaching or assessment choice is listed as “No Change” then we take the pre-COVID variable.
- We then calculate the proportion of the assessment method that has changed as a result of COVID. If this is strictly less than 50% (so equal to or less than 49%), then we take the pre-COVID variable for all teaching and assessment variables.
- If the proportion of assessment method has changed by 50% or more, then we take the post-COVID variable for all teaching and assessment variables.

4. We create a dataset of student characteristics. This will contain all the information about the students that was not affected by the teaching and assessment methods. This will be used as covariates in our regressions as well as for identifying relevant subgroups for analysis, such as disadvantaged learners. See Table in Section 8.

5. Create a dataset of student outcomes. This will contain for each student a set of marks for each module and year combination, as well as a binary indicator of progression to the next year of the course.
6. Create a merged dataset incorporating elements 1, 2, 3 and 4.
7. Create a series of charts to compare attainment and progression between disadvantaged learners and their peers for each of the different teaching and assessment choices. We will also compare attainment and progression between different modules using different teaching and assessment methods, using a range of demographic characteristics
8. Regress module marks (4) against student characteristics (3), and teaching and assessment choices (1), using OLS regression with fixed effects for module and year. We use robust standard errors, clustered at the module level. The basic model, including interactions for teaching hours or grade share is as follows:

$$Score_{i,m,y} = \alpha_0 + \beta_f T\_TYPE_{m,y} + \beta_g T\_MODE_{m,y} + \beta_j T\_TIMING_{m,y} + \beta_j A\_TYPE_{m,y} + \beta_k A\_MODE_{m,y} + \beta_l(DIS_i)(T\_TYPE_{m,y}) + \beta_o(DIS_i)(T\_MODE_{m,y}) + \beta_p(DIS_i)(T\_TIMING_{m,y}) + \beta_p(DIS_i)(A\_TYPE_{m,y}) + \beta_q(DIS_i)(A\_MODE_{m,y}) + \sum_{r=1}^{R} \beta_r CONTROLS_{i,r} + \beta_4 MODULE + \beta_5 YEAR + \varepsilon_i$$

Where Score is our outcome measure of score for each individual (i), module (m) and year (y). The regression includes a constant (α_0) and a set of (k) controls for each individual these are the covariates listed in the table above) and controls for module and year.

The coefficients of interest are β_l, β_o and β_p and β_q. Holding all else constant this provides us with an estimate of the relationship between disadvantaged student characteristics and teaching methods (T_MODE, T_TYPE and T_TIMING) or assessment methods (A_MODE and A_TYPE) and the students score.

We will use robust standard errors clustered at the module level.

As each of these has 3 elements (primary, secondary and tertiary methods), each will be a set of 3 coefficients for each of the methods. So, written out in full, these variables will be:

T_MODE_1

T_MODE_2

T_MODE_3

T_TYPE_1

T_TYPE_2

T_TYPE_3

A_MODE_1

A_MODE_2

A_MODE_3

A_TYPE_1

A_TYPE_2

A_TYPE_3

9. We define disadvantaged learners by each of the identifiers above. 22% of IMD codes are missing, compared with 7% of POLAR4 codes. The correlation coefficient between IMD and POLAR4 Quintiles is 63%. Therefore, we propose using POLAR4 Quintile codes and bursary eligibility as our preferred approach to identifying disadvantaged learners, as they provide a more complete picture of disadvantage and are broadly in line with the index of multiple deprivation. We will also rerun the analysis using IMD deciles 1 – 3 to compare the results.

   We include interaction terms between the teaching/assessment methods and dummies for the disadvantaged learner variables. A positive (negative) interaction coefficient means that the method had a positive (negative) effect on outcomes for disadvantaged learners.

Secondary outcome analysis

The secondary outcome we are interested in is student progression to the following year. We will assess this in the same way as the primary outcome, but use a binary outcome of progression / non-progression instead of the continuous outcome measure of module and course marks. For final year students we will use passing the course as the indicator that they have "progressed". We will use a Linear Probability Model to estimate this multiple regression. Since this is a binary outcome, as a robustness check we will also conduct a logistic regression.

$$
\begin{aligned}
Progress_{i,m,y} = {} & \alpha_0 + \beta_f T\_TYPE_{m,y} + \beta_g T\_MODE_{m,y} + \beta_j T\_TIMING_{m,y} + \beta_j A\_TYPE_{m,y} \\
& + \beta_k A\_MODE_{m,y} + \beta_l(DIS_i)(T\_TYPE_{m,y}) + \beta_o(DIS_i)(T\_MODE_{m,y}) \\
& + \beta_p(DIS_i)(T\_TIMING_{m,y}) + \beta_p(DIS_i)(A\_TYPE_{m,y}) \\
& + \beta_q(DIS_i)(A\_MODE_{m,y}) \\
& + \sum_{r=1}^{R} \beta_r CONTROLS_{i,r} + \beta_4 MODULE + \beta_5 YEAR + \varepsilon_i
\end{aligned}
$$

Additional analysis

1. In addition to the primary and secondary analysis focussed on disadvantaged students, we can also conduct the same analysis for other individual indicators of interest, as described by TASO:
   - Gender
   - Ethnicity
   - Whether or not the student has a disability

- Whether or not the student is a mature student
- Accommodation status during term time (student halls, private rented, living at home)

2. We might expect there to be an interaction between teaching type and mode. For example, online lectures may provide better outcomes than online seminars, and so additional analysis could map all of the available interactions between types and modes of teaching and assessment.
3. The analysis planned above gives equal weight to the primary, secondary and tertiary teaching and assessment methods used by the HEP. This is a simplification. We could adjust the analysis by interacting each mode/type with the hours or proportion of time spent. This would have the effect of increasing the weight given to the types used most intensely. **This would say something about the intensity of specific choices**. Or we could focus only on the primary teaching and assessment methods if we believe these are the most important.

4. The above analysis takes the teaching and assessment methods as a binary intervention that is either on or off (e.g. asynchronous or synchronous) during a specific year. However, we know that these methods were introduced at different times during the year (especially during the 2019/20 year, pre and post COVID) and therefore students were exposed to different intensities of intervention. As an additional analysis, we could look at including an additional variable for each of the intervention dummies which is a **duration** measure reflecting the period of time that the intervention was in place for.

For example, if lectures were provided F2F and synchronously for 50% of the year, and online and asynchronously for 50% of the year, then the dummy for F2F would include an intensity interaction term of 0.5.

Outliers and missing data

As a first step in the analysis, I will identify the extent of missing data for each variable (Missing/N) and chart each variable to understand their distribution and potential outliers.

It has already been identified that looking at individual level data, roughly 23% of students do not have an IMD score and roughly 7% of students do not have a POLAR score. 6.8% do not have either.

Observations with missing data will automatically be excluded when running regressions. Therefore, it will be important to identify where there are significant amounts of missing data within a variable so that we can either choose to exclude that variable from our analysis, investigate and request additional data from the HEP or, if

the variable is particularly important, we can try various methods for imputing the missing variable from the known information we have.

Variables with highly skewed distribution could violate the assumptions of the OLS/LPM regression models. In such cases we could seek to transform the data or use alternative modelling approaches.

Variables with outliers can also skew the results of regressions. By identifying any outliers in advance, we can check with the HEP whether the outlier is a genuine figure or a reporting error. In the former case I would not propose to make any transformations of the data. In the latter case, we can try to get a corrected version from the HEP or try another approach to impute the variable (such as winsorising), although I would prefer to keep this to a minimum.

11. Ethical considerations

This analysis only uses anonymised, secondary data, and does not require full ethical approval. Data sharing agreements will be established with HE providers.

12. Risks

Part of evaluation	Risk	Mitigation strategy	Risk owner
Data collection	HEPs are experiencing a busy term and finding the time to collate data to share with TASO is taking longer than initially anticipated. Risk of small dataset from a reduced number of partner providers.	TASO has taken a flexible approach to the research design and analysis. Having initially planned to use a diff-in-diff, we are now going to be conducting descriptive analysis.	TASO