Online lecture recordings during the COVID pandemic

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We analyse second-year UK undergraduates' use of study tools on a Macroeconomics unit in Autumn 2021, focussing on lecture recordings prepared for asynchronous use. We find no convincing evidence that students can be divided into groups with different study patterns: student heterogeneity consists largely of some students using more of all materials. Greater use of study materials is correlated with prior performance, but there is no correlation with gender or overseas status. Some, but not all, aspects of study are correlated with better marks in the Macroeconomics assessment, but our observational study is unable to draw strong conclusions about treatment effects of additional study methods, since we do not observe students' ability or private study.

The COVID pandemic led to a sudden requirement to produce video recordings to supplement or even replace traditional lectures and also led to a large increase in availability and use of video-conferencing for students to talk to staff (e.g. using Zoom). The purpose of this analysis is to see how new teaching method such as specially-recorded lectures interact with students' use of other teaching / studying methods, e.g. seminars. An original component of our analysis is that we observe students' engagement with both traditional teaching resources, in particular face-to-face seminar attendance and online asynchronous teaching resources.

The focus of our study is the series of teaching videos for asynchronous viewing. We observe which asynchronous lectures were observed by each student and whether they watched them early or late; the number of viewings; the coverage and total time spent using them. Our other variables are as follows: live online lecture attendance, face-to-face small-group seminar attendance, albeit both with some measurement error; the number of days students logged on the discussion board and the number of questions that they posted. Finally, we also have a record of the number of occasions that each student saw a member of the teaching staff for a bookable fifteen-minute one-to-one office hour using Zoom.

Contrary to existing studies which use machine learning methods to characterise different student learning types, we found no convincing evidence that the sample of students could be partitioned using a cluster analysis. Most of the observed heterogeneity is due to some students using more resources than others.

There is a high degree of correlation between the six variables on asynchronous lecture usage. To simplify our discussion, we use a principal components analysis as a form of data reduction (we obtain qualitatively similar results using all six variables separately). The first two components explain a high proportion of the total variance in the data (69%) and can be summarised as:

- Component 1: amount of time spent watching videos and watching videos early rather than late;
- Component 2: number of times that each video was watched and coverage.

We investigate the relationship of these learning components with observed pre-determined variables. Component 1 is strongly correlated with prior attainment (first-year economics mark), but not with gender or overseas-student status; component 2 is weakly correlated with gender. This suggests that what differentiates students is whether and how much they use the asynchronous material, not a hypothetical learning type.

We also estimate a regression of final Macroeconomics mark on both components (controlling for the use of the other teaching methods). Only component 1 was correlated with the final mark and this was only marginally significant when controlling for pre-determined variables: in particular, controlling for prior attainment dramatically weakens the explanatory power of the use of asynchronous lectures. Component 2 appears to have no correlation with the final exam mark. First-year marks explain 23% of the variance of the Macroeconomics mark; adding other pre-determined variables and asynchronous material only raises the explained variance to 29%. This suggests either that the benefit of the asynchronous material is small, or that students substitute away from other study methods or that there is a self-selection effect.

Although the new online learning environment is making possible the use of potentially rich data-intensive methods, our results underline some limitations/issues raised by these methods. First, the absence of evidence for different student learning types suggests that more studies will be needed to evaluate whether existing published results have been contaminated by some form of publication bias. Second, our inability to control for other study methods (such as time spent reading) means that the parameter estimates cannot be interpreted as causal, but the weak correlations that we estimate suggest that any benefits of these methods may be attenuated by student behaviour.