The digital transformation of teaching and learning for high-stakes assessment: teacher and student responses in England.

Sub-theme: National Test and Examinations

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Short Abstract

We discuss the use of digital technologies in reformed Mathematics A levels in England. We draw on evidence from a four-year study (2017-2021) exploring implementation of these qualifications. Pre-pandemic findings typically showed modest use of digital resources in teaching, although where utilised, teachers and students were positive about their potential for enhanced mathematics learning. Teachers' own limited experiences with technology and digital pedagogies, poor access to devices, and poor assessment reward for such activity, created disincentives for use, resulting in the marginalisation of key areas of the intended curriculum.

Pandemic-driven school closures saw participants rapidly adjusting to online learning, with accompanying digital tools primarily supporting communication, organisation and administrative purposes rather than subject-specific functions such as graphing or data handling. Early, significant challenges with teacher preparedness and student access to technology gradually improved and by Summer 2021, comparatively few students were experiencing serious access constraints, and teachers were developing confidence and fluency in using digital tools. However, in most cases the use of digital tools for specifically mathematical purposes stagnated or deteriorated. Since subject-specific use of digital tools can enhance learning in multiple powerful ways, it is important to find ways to support teacher and student adaptation to these also.

Long abstract

We report on the use of digital technologies in teaching and learning in England, drawing evidence from a four-year classroom close study (2017-2021). This study explored students' and teachers' experiences of reformed mathematics A levels. From 2020 onwards, it was adapted to explore the impact of the pandemic. It drew data from a fairly representative sample of up to 42 mathematics A level classes in 21 schools/colleges, collecting termly surveys or interviews from students and teachers, and full semi-structured lesson observations.

A level Mathematics is a key entry requirement for most mathematics intensive university courses in the UK, with A level Further Mathematics supporting further specialisation. From 2017 A levels in mathematics include greater depth and breadth of content and an emphasis on modelling, problem solving and reasoning, supported by enhanced use of digital tools for such purposes. They culminate in a high-stakes summative assessment at the end of two years of study, and have created opportunity for more aspirational, holistic engagement with mathematics, though often also put increased pressure on students and teachers (Redmond et al. 2020, Mason et al. 2021). Initial findings showed that pre-pandemic, many teachers

were making modest use of digital resources in teaching, other than internet-based resources. Teachers' lack of familiarity with appropriate subject-specific technology and pedagogies was, in some instances, a key barrier to more widespread use, but so was limited access to appropriate devices, students' poor foundations in using digital tools for mathematical purposes, and minimal credit for such activity in summative assessments.

For example, the 2017 reforms require engagement with a large dataset using suitable digital tools such as a spreadsheet or statistical package. Many teachers cited these challenges as underlying marginalisation of large dataset work, despite their widespread espoused valuing of its intentions (Redmond et al. 2019). Overall, a minority of teachers used, for example, graphing software, spreadsheets or statistical packages. However, where mathematics-specific tools were utilised, teachers and students were often positive about their capacity for supporting creative engagement with mathematics, consistent with Golding & Lyakhova (2021).

Pandemic-catalysed school/college closures for summer 2020, and again in early 2021, saw most students learning remotely. Summer 2020 and 2021 high-stakes examinations were cancelled. When schools/colleges reopened, teaching was often through a blend of classroom-based and remote learning. Initially, we evidenced widespread undermining of effective distance learning because of both teacher under-preparedness and limited student access to technology. However, both teachers and students at this upper secondary level often appeared to rapidly adapt to online interactions, rapidly upskilling technological skills and for teachers, pedagogy, while usually also recognising significant constraints of such approaches. They drew on digital tools such as learning platforms and emails that primarily supported communication, or organisational/administrative elements of teaching and learning, rather than subject-specific tools. Access to suitable devices, poor bandwidth and unsuitable physical spaces in which to undertake online learning were, for some time, key barriers, with some differential impact on students for poor socio-economic backgrounds.

By early 2021, these issues were significantly alleviated. In our summer 2021 data, while challenges remained, serious constraints were still evident for only about 5% of students, though they persisted also at school/college level. Teachers were developing greater confidence and fluency with using digital tools – though often still not for primarily mathematical purposes: for example, work on the large data set with technology was still widely marginalised. Our findings suggest that during the pandemic, rapid progress has been made in access to digital devices and in acquisition of digital pedagogy, knowledge and skills for communication, organisational or administrative purposes. However, in most cases the use of digital tools for specifically mathematical purposes had not changed significantly, and often remains under-utilised. Our data show both teachers and students attribute this at least in part to continued under-valuing of such approaches in high stakes assessments. Since subject-specific use of digital tools can enhance learning in multiple powerful ways (Golding & Lyakhova, 2021), it is important that means are found to support teacher and student adaptation to the use of these also.

References

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