



Department
for Education

The independent evaluation of the pilot of the linked pair of GCSEs in mathematics (MLP)

Fourth interim research brief

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Introduction

AlphaPlus Consultancy Ltd was commissioned – originally, in March 2010, by the Qualifications and Curriculum Development Agency (QCDA) and then, from March 2011, by the Department for Education (DfE) – to evaluate the pilot of the linked pair of GCSEs in mathematics (MLP). The pilot programme and the evaluation run until January 2014.¹ This research brief reports interim findings from the fifth round of fieldwork, conducted in autumn 2012. The brief also reports statistical analysis of the assessment data provided by awarding organisations participating in the pilot, matched to the national pupil database (NPD) and data about schools from Ofsted and Edubase. The analysis reported here builds on findings from the third interim report.

A change in government policy for examinations at key stage 4 (KS4) in England means that the MLP qualifications will now be 100% terminally assessed for students who started the programme of study from September 2012 (although assessment will still be unitised). This does not apply to students in Wales.

There has been a further small decline in the number of centres participating in the pilot. Based on information supplied by the four awarding organisations, there are currently (as at the end of October 2012) 245 pilot centres – AQA (89), Edexcel (91), OCR (55) and WJEC (10) – compared with 256 pilot centres in March 2012.

Background to the pilot and evaluation focus

The MLP qualifications are ‘methods in mathematics’ (Methods) and ‘applications of mathematics’ (Applications). The two qualifications together cover the entire KS4 programme of study (PoS) for mathematics but with some additional content. Neither qualification by itself covers the full KS4 PoS. A new single GCSE in mathematics was also developed for first teaching in September 2010 – the single qualification is ‘nested’ in the pair. Candidates should be entered for either the single GCSE in mathematics or for both qualifications of the MLP.

The single GCSE and the MLP were developed with three aims:

- increasing engagement with and participation in mathematics at GCSE and beyond
- enabling understanding of the relevance of mathematics
- offering opportunities to stretch and challenge all students.

There were also additional wider aims for the MLP. These were to:

- increase student commitment to mathematics and engagement with the subject

¹ The MLP pilot is funded by the Department for Education (DfE) in England and the Welsh Government in Wales.

- develop greater breadth and depth of subject skills and knowledge by undertaking two GCSEs, with additional content, to prepare students for progression to further study
- develop students' recognition of, and capacity to use, the different methods of enquiry encouraged by having two distinctive GCSEs.

The overarching research questions for the evaluation of the MLP are:

- How are the MLP qualifications being implemented?
- What has been the impact of the MLP qualifications on the teaching and learning of mathematics (including the impact on student engagement, and on students' skills, knowledge and understanding, in terms of breadth and depth of understanding of mathematics)?
- To what extent are the MLP qualifications appropriate for different student cohorts and different centres?
- What is the impact of the MLP on students' participation, attainment and progression?
- What is the 'value' of the MLP qualifications over and above what is offered by the single GCSE?

The overall aim of the evaluation is to consider the extent to which the MLP offers a different experience of learning mathematics from the new-specification single GCSE. The evaluation has collected fieldwork data over the first two years of the pilot and has included visits to case-study pilot centres, pilot-centre online surveys, and stakeholder telephone interviews and focus groups. New data has been collected for this report from a third pilot-centre online survey, interviews with 32 joint-offer centres (pilot centres offering the single mathematics GCSE to some of their students rather than, or in addition to, the MLP) and a focus group with the awarding organisations. Further statistical analysis of assessment data has also been undertaken following the summer 2012 examinations.

Key findings

- The MLP has completed its first two-year cycle. Changes to government policy mean that the future of the MLP remains uncertain. This uncertainty, together with the late decision to extend the availability of the qualifications for a further year, has led centres to behave in a range of ways, as evidenced from the qualitative interviews: withdrawing from the pilot or deciding not to enter any further cohorts, entering students for the single GCSE in mathematics as well as the MLP assessments, entering students for both papers for one qualification at the end of Year 10 rather

than using an integrated approach, and entering fewer students for the pilot qualifications.

- Statistical analysis (comparison of similar groups, and regression modelling) was used to compare students' attainment on the MLP with that on the single GCSE. It showed that students had done a little better on MLP qualifications (in terms of grade outcomes) than on the single GCSE, particularly when the opportunity to select the better of two grades was considered (in either Methods or Applications), and particularly for students with high prior attainment (national curriculum level 5 at KS2).
- The consensus from the majority of heads of mathematics (HoMs) from joint-offer centres interviewed was that the MLP provides a better foundation for A level studies than the single GCSE. HoMs considered that introducing students to a number of additional topics, albeit at a simpler level than that at which students will encounter them at A level, supported progression. They felt that the MLP enriches and expands students' knowledge in appropriate ways without 'fast-tracking' them to A level, which several HoMs saw as undesirable. However, some pilot centres that felt they needed to deepen students' grasp of the most difficult GCSE topics and provide them with 'a trial run at AS level', also reported using additional bridging qualifications.

Summary of findings

The appropriateness of the MLP qualifications for different cohorts of student and different centres

Centre participation

The main reasons given by centres for taking part in the pilot have remained broadly the same since the awarding organisations started to recruit centres for the pilot. The two reasons most commonly cited in the autumn 2012 pilot centre online survey both refer to the opportunity for students to gain two GCSEs in mathematics (rewarding the effort required for the KS4 mathematics PoS, or for parity with English, English literature and science GCSEs); the third reason most commonly given was the opportunity to stretch higher-attaining students.

The MLP has completed its first two-year cycle. Changes to government policy, including the recently aborted proposal to introduce English Baccalaureate Certificates (EBCs) and the now proposed changes to GCSEs, mean that the future of the MLP remains uncertain.² This uncertainty, together with the late decision to extend the availability of the qualifications for a

² At the time data was collected for this report it was expected that one or more EBCs would be introduced to replace GCSE mathematics.

further year, has led centres to behave in a range of ways: withdrawing from the pilot or deciding not to enter any further cohorts, entering students for the single GCSE in mathematics as well as the MLP assessments, entering students for both papers for one qualification at the end of Year 10 (rather than using an integrated approach), and entering fewer students for the pilot qualifications. The findings from the evaluation need to be considered within this context.

Representativeness of the pilot centres and cohorts

Academies, community and foundation schools have a higher representation among the pilot schools in England than would be expected by chance; others – including pupil referral units (PRUs), independent schools and special schools – are less well represented. There are no further education (FE) colleges in the pilot. In Wales, community schools are over-represented.

As previously reported, and as is often the case with pilot programmes, a slightly larger proportion of higher-attaining schools are taking part in the pilot than would be expected by chance. The proportions of candidates for single GCSE and MLP entries by school type, however, show that candidates from academy converters are heavily over-represented and that community and foundation school candidates are under-represented (despite the fact that these schools are numerically over-represented). This suggests that community and foundation schools are putting in a smaller proportion of their cohorts and are thus being the most selective of all pilot centres with their entries.

There are proportionally more recorded completions for male candidates on the MLP than for single GCSE mathematics, with male candidates completing 51.9% of recorded MLPs (compared with 49.9% completed by male candidates in single GCSE mathematics in 2012 – similar to 2011). In addition, compared with candidates taking the single GCSE mathematics, a higher proportion of MLP candidates are:

- of white British origin
- speak English as their first language
- are not eligible for free schools meals (FSM)
- have no registration for special educational needs (SEN).

The MLP cohort also contains a disproportionately high number of higher-attaining candidates (based on their attainment in mathematics at KS2).

Appropriateness of the MLP for different student groups

There was a continuing lack of consensus about the suitability of the MLP for the majority of student groups. The statistical data showed a large proportion of higher-attaining students in the pilot. Evidence from the online survey and the interviews suggests that many pilot centres had used the qualifications to stretch and challenge higher-tier students. Some pilot centres have been unwilling to put C/D grade borderline students in for the pilot qualifications, as they do not want to run the risk of students not achieving their C grade in

mathematics. A relatively large number of centres continued to enter the whole cohort for the MLP, but there remained concerns that the MLP may not be suitable for some lower-attaining students whose low levels of literacy mean that they struggle to understand what is required when faced with scenario-based/contextualised tasks. There is more applications of mathematics in the MLP than the single GCSE.

The impact of the MLP on student participation, student attainment and progression

Attainment

Comparison of attainment outcomes between MLP candidates and single GCSE candidates is complicated by the facts that:

- some MLP candidates complete one of their MLP qualifications early (typically 'Methods', in Year 10) and will therefore have had less time to study than most of their single GCSE counterparts
- MLP candidates take the better grade from their two MLP qualifications as their GCSE mathematics attainment equivalent. In most cases, for the purposes of performance targets, schools also report the better of the two grades achieved. Throughout the analysis for this report, except where otherwise stated, performance on MLP was taken to be the better of the two grades obtained, where a difference exists.

Two separate analyses (comparison of similar groups, and regression modelling) were used to compare students' attainment on MLP with that on the single GCSE.

They show that students do a little better on MLP qualifications (in terms of grade outcomes) than on the single GCSE, particularly when the opportunity to select the better of two grades is considered, and particularly for students with high prior attainment (national curriculum level 5 at KS2). The difference here is about a quarter of a grade, whereas it is about one-tenth of a grade at lower attainment.

In considering the reasons for the difference in attainment between MLP and the single GCSE it is not possible to separate the possible effects on the MLP grades of better teaching and learning or of more generous grade boundary setting in the MLP.

Progression to further study

Of the pilot centres responding to the online survey that knew which courses their students had progressed to following year 11, most felt that the number of students progressing to level 3 mathematics or STEM-related subjects had either largely stayed the same or gone up. Of the 27 centres reporting a rise in the numbers of students progressing, 14 attributed this rise directly to the MLP.

In this interpretation of the findings, a distinction needs to be made in relation to centres' perception of what they think is required of a qualification for it to be 'a good preparation for A level study'. The consensus from the majority of HoMs from joint-offer centres interviewed was that the MLP provides a better foundation for A level studies than the single GCSE. HoMs considered that introducing students to a number of additional topics, albeit at a simpler level than that at which students will encounter them at A level, supported progression. The three topics most commonly cited as useful were algebra, pre-calculus (area under a curve) and linear programming. The greater emphasis on application of mathematics and use of mathematical problem-solving skills was seen to support students in progressing to A level studies. Two-thirds of the HoMs who commented on bridging qualifications felt that they were neither necessary nor desirable: they felt that the MLP enriches and expands students' knowledge in appropriate ways without 'fast-tracking' them to A level, which several HoMs saw as undesirable. They argued that students who undertake bridging qualifications are in danger of lacking motivation at AS, as they will already have covered a lot of the ground at that level in their bridging qualifications.

That said, a third of the HoMs interviewed were using or planning to use bridging qualifications. They thought that these were useful and necessary to stretch and challenge their highest-attaining students, as the MLP was not more difficult than the single GCSE. They welcomed the opportunity that the bridging qualifications offered to deepen students' grasp of the most difficult GCSE topics and provide them with 'a trial run at AS level'. HoMs liked the large amount and depth of algebra and the way in which the bridging qualifications engaged students in calculus and differentiation.

The impact of the MLP qualifications on the teaching and learning of mathematics

Teaching and learning

Findings from the online survey and interviews indicate that centres continue to be enthusiastic about the breadth of learning the MLP offers, although there remains a lower level of consensus on the extent to which the MLP promotes depth of mathematical understanding. Overall, however, the majority of centres felt that the MLP offered more opportunity for breadth and depth than the single GCSE.

Centres recognising that the MLP promoted depth of mathematical understanding felt that this was due to: the breadth of topics, which allowed more connections to be made; greater opportunities for practising the skills, especially problem solving; more opportunities to apply mathematics by having a whole GCSE that is focused on applications; an opportunity to introduce pre-calculus work. Some centres continue to report that they would like to see more algebra in the MLP, but this position appears to relate mainly to perceptions of how much algebra is assessed rather than what is in the specification.

Respondents to the online survey were asked to indicate the extent to which they believed the MLP and the single GCSE promoted teaching practices such as: high-order questioning, stretching and challenging, creating connections, encouraging reasoning, supporting

development of strategies for investigation and problem solving, encouraging the recognition of the role of mathematics in everyday life, making learning explicit, and developing 'mathematical' language.³ The majority of centres that offered the single GCSE as well as the MLP felt that the MLP promoted the pedagogic approaches more than the single GCSE.

The 'value' of the MLP qualifications over and above what is offered by the single GCSE

Based on the perceptions of pilot centres offering the MLP and the single GCSE:

- The MLP was thought to provide more stretch and challenge to higher-attaining students than the single GCSE; this was reflected in the fact that proportionately more higher-attaining students were selected for the MLP.
- The MLP was also seen to provide a better foundation for A level studies than the single GCSE (and thus to aid progression) because of its additional topics, greater emphasis on application of mathematics, its use of mathematical problem-solving skills – and, to some extent, because students found it more engaging.
- The three topics that were considered most useful in stretching and challenging students and supporting progression in the MLP were algebra (two-thirds of the HoMs interviewed felt there was more algebra in the MLP than the single GCSE), pre-calculus (area under a curve) and linear programming.
- A large majority of the joint-offer pilot centres thought that the MLP encouraged a broader understanding of mathematics than the single GCSE. A smaller majority held the view that the MLP encouraged deeper mathematical understanding than the single GCSE, those that did cited the breadth of topics (which allowed more connections to be made), greater opportunities for practising problem-solving skills, more opportunities to apply mathematics, and an opportunity to introduce pre-calculus work.

³ Based on the work of Swan, M (nd).



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