Sussex Learning Network

National Collaborative Outreach Programme

University of Brighton

MATHS GCSE RESIT SUPPORT PROJECT

Final Research Report

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The educational performance of pupils in England from disadvantaged background is much lower than that of their peers, with pupils from disadvantaged backgrounds being twice as likely to not be in education, employment or training and be at a higher risk of ending up in poverty as adults (Sharp et al., 2015, 5). The Higher Funding Council for England (HEFCE) developed the National Collaborative Outreach Programme (NCOP) which became operational in January 2017 and will run to December 2020. As part of the programme, there is a requirement to target disadvantaged students in years 9-13 (ages 13 to 18) living in identified ward areas where progression into Higher Education is lower than expected based on GCSE attainment figures.

The Sussex Learning Network (SLN) was one of 29 successful consortia to receive NCOP funding from HEFCE in 2017[1]. At this time, 14,235 students in years 9-13 were identified as residing in NCOP wards in Sussex. The SLN recognised that support with Maths GCSE resit examinations was an area that would benefit this group of students, especially given that Government policy dictates that all 16-19 year-old students in England undertaking a programme of study for more than 150 hours per year, who have not reached a minimum of Level 4 (Grade C) in GCSE Maths, must continue to study for an approved qualification in the subject until they reach this minimum level.

Researchers and the Maths specialist team from the School of Education at the University of Brighton (UoB) were successful in bidding for funding from the SLN to develop a programme of support to enhance the teaching and learning of Maths GCSE resit students, aged 16-19, in Further Education (FE) Colleges throughout Sussex who were living in identified NCOP ward areas.

The Maths GCSE resit project, which ran from October 2017 to December 2019, aimed to develop bespoke professional development programmes for Maths GCSE resit tutors across FE colleges in Sussex. For each of the participating FE colleges, the project aimed to:

- Review the work of Maths GCSE teams and individual tutors (where requested) and develop bespoke professional development to support their delivery of Maths GCSE resit programmes.
- Develop bespoke diagnostic testing and individual learning plans for Maths GCSE resit students in FE, where Maths tutors and students indicated a preference for this.

The research element of the project had three related, additional aims:

- To identify Maths GCSE resit tutors' professional development needs.
- To identify Maths GCSE resit tutors' and Maths GCSE resit students' perspectives of what supports and what hinders Maths GCSE resit students' learning.
- To report on changes in students' Maths GCSE grades following the implementation of the Maths GCSE resit support programme.

Although the project funding was specifically targeted at supporting NCOP students resitting Maths GCSE, Maths GCSE resit lessons are attended by both NCOP and non-NCOP students, thus measures to support NCOP Maths GCSE resit students and their tutors automatically benefitted all Maths GCSE resit students in these classes.

[1] The Office for Students (OfS), which was established in January 2018, inherited HEFCE's funding responsibilities and now funds the work of the SLN NCOP programme.

Key findings

1. The professional development needs of college Maths GCSE resit tutors

The specific professional development needs of the college Maths GCSE resit tutors can be classified into common themes as follows:

Supporting Maths GCSE resit tutors to:

- Become more familiar and confident with the new Maths GCSE syllabus.
- Increase subject knowledge and confidence in teaching Maths (especially in the case of less experienced Maths tutors).
- Develop Schemes of Work (SoW) to meet students' needs, rather than trying to cover the whole syllabus with all students and repeating topics in which many students already feel confident.
- Devise ways of measuring student progress and differentiating work for students of different abilities.
- Analyse students' answers to past GCSE examination papers to identify trends, strengths and gaps in knowledge, and develop diagnostic analyses for individual, class or cohorts of students (depending on Maths tutors' preferences) to enable this information to be used to set future homework and inform lesson planning.
- Improve behaviour management skills.
- Develop effective questioning to challenge students.
- Develop creative, exciting starters for lessons.
- Develop strategies to improve students' basic numeracy.
- Help students to develop an exam strategy to help raise achievement and lower anxiety.
- Implement measures to:
    - increase Maths GCSE resit students' mathematical literacy and confidence in their ability in Maths;
    - increase levels of student engagement;
    - develop programmes of work for low attainers;
    - prepare students, including increasing their confidence, for taking their Maths GCSE resit examination, especially in cases where students have had more than one previous attempt at the examination;
    - enhance students' revision skills.

GCSE Maths tutors also stated that they would like:

- To observe members of the UoB's School of Education Maths specialist team model lessons for them to observe and discuss.
- To be observed by a member of the Maths specialist team. However, tutors specifically stated that they did not want formal written feedback on these observations; their preference was for confidential, informal conversations between the observer and the tutor following an observation.
- Opportunities to share best practice with Maths GCSE resit tutors from other colleges.

2. Maths GCSE resit tutors' perspectives of what supports and what hinders Maths GCSE resit students' learning

Factors that facilitate students' learning, as identified by Maths GCSE resit tutors

- Being able to identify, and address, where students' mathematical misconceptions create a barrier to understanding.
- Short Maths lessons once or twice per week, rather than more lengthy lessons during which students lose concentration.

- Ensuring students are prepared for the content of the new specification Maths GCSE examination.

Barriers to teaching and learning identified by Maths GCSE resit tutors

- 'Maths anxiety', low attendance, disengagement and lack of motivation amongst students.
- Maths GCSE resit lessons being perceived by students as a punishment, for example, in cases where students are threatened with being removed from their course if they do not attend Maths GCSE resit classes.
- Students being 'pushed' into Maths GCSE programmes of study and examinations when they are not considered to be ready or academically able to achieve a pass, for example, where their previous attainment in Maths has been very low.
- Lack of tutor confidence in teaching Maths GCSE.
- Lack of support from vocational tutors about the relevance of Maths to their subject.

3. Maths GCSE resit students' perspectives of what supports and what hinders Maths GCSE resit learning

Factors facilitating students' learning identified by Maths GCSE resit students

- Practicing/completing past Maths GCSE examination questions.
- Tutor encouragement and praise, particularly when students have completed work to a high standard and/or have put a lot of effort into completing a piece of work.
- 1-1 support from Maths tutors – this was considered crucial for learning, especially where support was given in areas in which students lacked mathematical understanding.
- Tutors being aware of the areas of Maths on which to focus attention – students considered it a waste of time for Maths tutors to attempt to go through the whole GCSE syllabus, including areas in which they were already knowledgeable.

Barriers to learning identified by Maths GCSE resit students

- Maths lessons being too lengthy – where Maths lessons were longer that two hours students found it difficult to concentrate.
- Maths classes being too large - students identified a class size of approximately 10 as the optimum size, with classes of 20 resulting in them getting too little support from Maths tutors.
- Lack of interest in Maths - many students lacked interest in Maths as they considered they did not need a pass in, or knowledge about, the subject for their future career.
- Lack of confidence in their Maths ability - many students lacked confidence in their own ability in Maths, often assuming that they were unlikely to pass their GCSE resit exam.

Drawing on the professional development needs identified by Maths GCSE resit tutors, and the facilitators and barriers identified by the tutors and Maths GCSE resit students, the UoB Maths specialist team developed various forms of bespoke professional development for whole Maths teams, as well as for individual tutors, within the participating colleges. These included:

- Professional development days hosted by the UoB's School of Education's Maths specialist team, open to all college Maths GCSE resit tutors. One of the key factors that contributed to the success of these days was that the college Maths tutors and the Maths specialist team co-constructed SoW and a lesson structure for use in the colleges.
- Bespoke professional development sessions and days at individual colleges, based on the specific needs of tutors within each of the colleges.
- Observations of, and confidential feedback to, individual Maths GCSE resit tutors.

- The development of bespoke resources in line with the requirements of individual tutors and colleges, to support the teaching of GCSE Maths resit students. These were made available to all Maths tutors in the participating colleges through an online resource hub.
- The development of bespoke diagnostic testing for Maths tutors for use with Maths GCSE resit students.

4. Impact of the Maths GCSE resit programme

Number of Maths GCSE resit students reached by the project

Significant numbers of Maths GCSE resit students were, and are being, reached[2] by the Maths GCSE resit project. In the 2017/18 academic year 2460 students were reached by the project; of these, 511 were NCOP and 1949 non-NCOP students. With regard to the 2018/19 academic year, we estimate[3] that 2856 Maths GCSE resit students are being reached; of these, 761 are NCOP and 2095 non-NCOP students.

Overview of changes in Maths GCSE resit pass rates for NCOP and non-NCOP students

Over the past three academic years, the number of NCOP and non-NCOP students resitting Maths GCSE across the participating colleges has gradually increased from:

- 1628 students (337 NCOP, 1291 non-NCOP) in the 2015/16 academic year; to
- 2048 students (447 NCOP, 1571 non-NCOP) in the 2016/17 academic year; and
- 2460 students (511 NCOP, 1949 non-NCOP) in the 2017/18 academic year.

The total number and percentage of NCOP and non-NCOP students achieving a pass in their GCSE Maths resit exam has gradually decreased over these three years, with:

- 30% of NCOP students (n=102) and 39% of non-NCOP students (n=499) achieving a Maths GCSE pass in 2015/16;
- 20% NCOP (n=416) and 16% of non-NCOP students (n=76) achieving a pass in 2016/17; and only
- 14% of NCOP (n=337) and 8% non-NCOP students (n=43) achieving a pass in 2017/18.

Although lower percentages of NCOP students, when compared with non-NCOP students, achieved a pass in their GCSE resit exam for each of these years, there has been a gradual decrease in the percentage gap between NCOP and non-NCOP students passing their Maths GCSE resit exam. Findings indicate that:

- 9% fewer NCOP than non-NCOP students achieved a pass in their Maths GCSE resit in 2015/16;
- 6% fewer NCOP than non-NCOP students achieved a pass in their Maths GCSE resit in 2016/17; and only
- 2% fewer NCOP than non-NCOP students achieved a pass in their Maths GCSE resit in 2017/2018.

Changes in NCOP students' Maths GCSE grades between beginning and end of academic years

Very limited data was available relating to the Maths GCSE grade of individual students on entry to college and their Math GCSE resit grade at the end of the academic year. However, the data that was available illustrated that over the past three academic years, the percentage of NCOP students achieving a higher Maths GCSE grade in their resit exam (than the grade they achieved in their previous attempt) has fallen slightly between 2015/16 and 2017/18.

[2] A student was considered to have been reached by the project where their Maths tutor had undergone one or more forms of professional development offered by the Maths GCSE resit project.

[3] Please note these figures are 'best guesses' as it is not clear whether some figures provided by colleges include a small number of students who fall outside of the 16-19 age bracket.

- Of the 153 NCOP students for whom data was available for 2015/16, 38% (n=58) achieved a higher grade in their resit exam and, of the 334 NCOP students for whom data was available for 2017/18, 35% (n=115) achieved a higher grade.
- The percentage of NCOP students achieving the same grade in their resit exam increased slightly over these three years, with 39% (n=59) of students achieving the same grade in their resit exam in 2015/16 and 45% (n=151) of students achieving the same grade in their resit exam in 2017/18.
- The percentage of NCOP students achieving a lower grade decreased slightly over the three years, with 23% (n=36) students achieving a lower grade in their resit exam in 2015/16 and 21% (n=68) achieving a lower grade in their resit exam in 2017/18.

Thus, findings indicate that the percentage of Maths GCSE resit students who achieve a pass in their resit exam is gradually reducing. This can, to some extent, be accounted for by the national trend which suggests that average national pass rate for GCSE Maths resits dropped by 2.8% from 25.4% in 2017 to 22.6% in 2018 (Burke, 2018). Additionally, Speilman (2017) cited that less than a fifth of students managed to achieve a GCSE pass in Maths when they retook their GCSE and 'around two-thirds of students did not manage to improve their grade'.

Impact of student attendance on Maths GCSE resit grades

The attendance data available for Maths GCSE resit students was limited to only two of the colleges and related to the 2017/18 academic year only, thus a full picture of the impact of attendance at GCSE Maths resit lessons on Maths GCSE resit students' achievement cannot be ascertained. Due to this limited data set, and the fact that no significant difference was found between NCOP and non-NCOP students in terms of the impact of attendance on Maths GCSE resit grades, findings reported relate to the collective attendance data for both NCOP and non-NCOP students.

Attendance data that could be cross referenced with the Maths GCSE entry and resit grades of individual students was available for 534 students in the 2017/18 academic year. Of these students, 162 (30 %) achieved a higher GCSE grade in their Maths resit exam when compared to their previous GCSE grade; 249 students (47%) achieved the same grade; and 123 students (23%) achieved a lower grade in their Maths resit exam.

Overall, findings suggest that where students' attendance rates at Maths GCSE resit classes were 80% or higher, they were more likely to achieve a higher GCSE grade in their resit exam, and where attendance rates were 50% or below, students were most likely to achieve a lower GCSE grade in their Maths resit exam.

Caution must be exercised when interpreting the above findings, however, as a new GCSE specification was introduced in 2015, with the first exam aligned to this specification being introduced in June 2017 and all schools and colleges being required to work to the new specification from the June 2018 exam onwards. The new GCSE Maths specification involved students learning material that may not have been previously covered when they first attempted Maths GCSE, as well as a new grading system. Some of the participating colleges taught to the new specification from September 2016, and others started to teach this specification in 2017. Thus, for some students, differences between their Maths GCSE grades on entry to college and their GCSE resit grades related to two different programme specifications with two different grading systems, making it almost impossible to make meaningful comparisons between the different data sets.

Changes in Maths tutors' teaching practices as a result of the maths GCSE resit programme

Although Maths GCSE resit data does not indicate significant increase in the number of GCSE passes, for reasons outlined above, the professional development and support provided by the Maths

specialist team during the 2017/18 academic year has had a very positive impact on Maths tutors. Feedback from Maths tutors suggests that the Maths GCSE resit project has impacted positively on their teaching practice and tutors now:

- Give more consideration to/make more use of prior knowledge.
- Give more consideration to the quality of feedback.
- Make more use of diagnostic questioning.
- Make more use of available Maths resources.
- Have introduced more fluent starters to maths lessons.
- Give more consideration to the choice of resources/think more about resources to ensure they are fit for purpose.
- Have adopted improved questioning strategies.
- Use more challenging questions in lessons to engage learners.
- Encourage learners to think more about topics.
- Check more regularly for group understanding.
- Include more discussion in class.

The following quotes by Maths tutors further highlight the positive impact of the Maths GCSE resist project.

- *It's changed everything.*
- *I have re-adjusted my teaching by using new and different strategies* (shared by the UoB maths team).
- [Working with the UoB Maths team] *has led us to think in detail about our lesson structure and to try incorporating more diagnostic questioning.*
- *Provided a solid structure of lessons and planning.*
- *Improved teamwork and lesson delivery.*
- *I'm more confident in my delivery. Many more strategies and ideas to try.*
- *As a relative newcomer to teaching it has given me lot of guidance and ideas which I have been able to put into practice.*
- *Planning feels a lot more organised and having input from subject specialists like Emma and James is inspiring.*
- *The project has given us the chance to re-evaluate our teaching with input from external sources and discussion with other colleges.*
- *It's been great working with other colleges and sharing best practice and I know colleagues have rediscovered their love for teaching as a result of this new lesson structure.*

Maths tutors' perceptions of how the Maths GCSE resit project is likely to impact on students

- Improve numeracy skills.
- Improve motivation and engagement.
- Lead to deeper level of thinking and understanding, and greater retention of knowledge.
- Develop greater understanding of concepts rather than just methods.
- Enhance ability at problem solving skills.
- Lead to more active participation in lessons.
- Increase confidence.
- Enhance progress and attainment Maths.

The following quotes by Maths tutors highlight the positive impact of the Maths GCSE resist project on students:

- *They achieve more work in lessons, complete homework.*
- *Improved engagement, better behaviour in some areas.*
- *Improvement in basic numeracy.*

- *Because of the structure of lessons, students are more engaged.*
- *It's made me feel excited about outcomes and I love seeing improvement already in my learners.*

Maths tutors' responses to questions about whether aspects of the professional development activities had been of benefit to them

- *The input of new ideas…has been brilliant. Every session has been invaluable and had a direct impact on my teaching and learners.*
- *Overall, I feel the impact and benefit that I have received during these training session and CPD days through opportunities to share good working practice with other teachers, networking, sharing resource ideas etc.*
- *Observations (first time I have been observed by a Maths teacher in 4.5 years), CPD days (always good to speak to colleagues).*
- *Observations and feedback - constructive and positive. Far more impactful than observations I've had at the college previously.*
- *Been next to no other training I have had. It has had a huge impact on me as an experienced teacher. I am now looking at each lesson with a new angle.*
- *You [the maths' team] have been very inspirational. Much appreciated.*
- *I have re-adjusted my teaching by using new and different strategies* (shared by the UoB maths team).
- [Working with the UoB Maths team] *has led us to think in detail about our lesson structure and to try incorporating more diagnostic questioning.*
- *Working in FE can feel like the wild west at times, where 'normal' (school) rules (expectations) don't exist. The importance of this project is that you feel like your job and role is being taken seriously.*
- *The CPD events always leave us enthusiastic about improving our teaching. They are honestly the most worthwhile training days I've had as a teacher.*

1. Introduction

1.1 Background to the research

Research indicates that the educational performance of pupils from disadvantaged background is much lower than that of their peers, and England has a relatively large achievement gap when compared with other countries in the Organization for Economic Cooperation and Development (OECD) (Sharp et al., 2015, 5). For example, in the 2013/14 academic year, children from disadvantaged backgrounds achieved lower GCSE grades than those from other backgrounds, with 36.5% of disadvantaged pupils achieving at least five A* - C GCSEs (or equivalent), including English and Maths, compared to 64.0% of all other pupils - a gap of 27.4 percentage points (DfE, 2015, 3). Disadvantage has a significant influence on pupils' life chances, with pupils from disadvantaged backgrounds being twice as likely to be not in education, employment or training and be at a higher risk of ending up in poverty as adults (Sharp et al., 2015. 5).

Findings from research conducted by the National Foundation for Educational Research (NFER) suggests that schools can respond to the complexity of disadvantaged pupils' needs by tackling it at three levels: a whole school approach to learning which sets high aspirations for all pupils; strategies to identify and support under-performing pupils (not just low attainers); and strategies specifically targeted at supporting pupils from disadvantaged backgrounds (Sharp et al., 2015 12). This report presents findings from a project aimed at supporting Maths GCSE resit students living in identified areas of disadvantage. The Maths GCSE resit project is one of many projects directed at supporting students in England from disadvantaged backgrounds.

1.2 The national context

The National Collaborative Outreach Programme (NCOP) was developed in 2016 by the Higher Funding Council for England (HEFCE) in response to the Government's ambition to double the proportion of students from disadvantaged backgrounds entering higher education by 2020; it became operational in January 2017 and will run to December 2020. As part of the NCOP, there is a requirement to provide intensive outreach for students in years 9-13 (aged 13 to 18) living in identified ward areas where progression into Higher Education is lower than expected based on GCSE attainment figures.

Government policy dictates that all 16-19 year-old students in England undertaking a programme of study for more than 150 hours per year who have not reached a minimum of GCSE Maths at grade C/Level 4 must continue to study for an approved qualification in the subject until they reach this minimum level. Thus, large numbers of students within this age range, including many living in disadvantaged areas, retake Maths GCSE with some students retaking the examination several times.

1.3 The local context: the Sussex Learning Network

The Sussex Learning Network (SLN) was one of 29 successful consortia to receive NCOP funding from HEFCE in 2017[4]. Currently the SLN have funding for this work until June 2019. Data supplied by HEFCE and the Higher Education Access Tracker in March 2017 indicated that there were 14,235 students in years 9-13 residing in identified NCOP wards in Sussex. The SLN recognised that support with Maths GCSE resit examinations was an area that would benefit this group of students.

[4] The Office for Students (OfS), which was established in January 2018, inherited HEFCE's funding responsibilities and now funds the work of the SLN NCOP programme.

Researchers and the Maths specialist team from the School of Education at the University of Brighton (UoB) were successful in bidding for funding from the SLN to develop a programme of support to enhance the teaching and learning of Maths GCSE re-sit students, aged 16-19 in Further Education (FE) Colleges throughout Sussex, who were living in identified NCOP ward areas. The project ran from October 2017 to December 2019. An extension to the project has since been granted and the second phase of the project will run from January to July 2019.

1.4 Project aim

The Maths GCSE resit project aimed to develop bespoke professional development programmes for Maths GCSE resit tutors across FE colleges in Sussex. More specifically, for each of the participating FE colleges the project aimed to:

- Review the work of Maths GCSE teams and individual tutors (where requested) and develop bespoke professional development to support their delivery of Maths GCSE resit programmes.
- Develop bespoke diagnostic testing and individual learning plans for Maths GCSE resit students, where Maths tutors and students indicated a preference for this.

The research element of the project had three related, additional aims:

- To identify Maths GCSE resit tutors' professional development needs.
- To identify Maths GCSE resit tutors' and Maths GCSE resit students' perspectives of what supports and what hinders Maths GCSE resit student learning.
- To report on changes in students' Maths GCSE grades following the implementation of the Maths GCSE resit support programme.

Research into Maths tutors' and students' perspectives was central to the development and running of the professional development support programmes and emphasis was placed on ensuring that the design of all such programmes closely aligned with the needs and wishes of the Maths tutors and students they were supporting.

It should be noted that although the SLN funding for this project was specifically targeted at supporting NCOP students resitting Maths GCSE, other (non-NCOP) Maths GCSE resit students also benefited from the project as NCOP and non-NCOP students attended the same Maths GCSE resit lessons, thus measures to support NCOP Maths GCSE resit students and their tutors automatically benefitted all Maths GCSE resit students in these classes.

2. Methodology

The Maths GCSE resit support programme was developed by drawing on the subject pedagogical expertise of the UoB's School of Education's Maths team and on findings from research which identified factors which enable, and those which constrain, the teaching and learning of Maths GCSE resit students.

2.1 Participating colleges

At the outset of the research, in October 2017, all FE colleges across Sussex were invited to participate in the project. Four colleges expressed an interest in participating – Sussex Coast; Sussex Downs; the newly merged Central Sussex and Chichester College; and Greater Brighton Metropolitan College (GBMet). For each of these colleges, Maths GCSE resit classes took place in at least two

campuses and, for one of the colleges, in over five different campuses. Furthermore, the project took place during a time in which some of the colleges were merging to form larger, often geographically spread colleges. In one case, following the merger of two colleges, two campuses were over 40 miles apart. This presented natural difficulties in terms of planning joint Schemes of Work (SoW) and professional development sessions especially as, in most cases, staff from the different campuses had not worked together prior to the college merger.

Before commencing the data collection, the research element of the Maths GCSE resit project received a favourable ethical opinion from the UoB's School of Education Ethics Panel.

2.2 Data collection and analysis

To address the research aims, both qualitative and quantitate data were collected and analysed.

2.2.1 Addressing research aims 1 and 2

To identify:
Maths GCSE resit tutors' professional development needs; and
Maths GCSE resit tutors' and Maths GCSE resit students' perspectives of what supports and what hinders Maths GCSE resit student learning.

One of the initial tasks of the project was for the researchers to identify the Maths GCSE resit tutors' perspectives of their professional development needs, as well as their perceptions' and Maths GCSE students' perceptions of factors that support and those that hinder GCSE Maths teaching and learning. Qualitative data was collected through meetings and semi-structured interviews with senior members of college staff and individual Maths' GCSE resit tutors, and with focus groups of between three and seven students. Care was taken to ensure the tutors interviewed taught GCSE Maths resit students living in NCOP wards, and that students in the focus groups included at least some from identified NCOP wards. In all cases, the interview questions were purposefully kept as open as possible, for example, questions posed to tutors and students included: Tell me about your experiences of teaching/learning GCSE Maths resit students; What do you think helps students' learning? What do you think hinders students' learning? Additional questions relating to tutors' professional development needs were included in interviews with GCSE Maths resit tutors and Maths subject leads, and data was also collected from written feedback and informal interviews with the Maths tutors during professional development sessions run as part of the Maths GCSE resit project.

Feedback was received directly from 14 senior staff in colleges, 46 Maths GCSE resit tutors and from 42 Maths GCSE resit students, and indirectly through informal conversations with far greater numbers of tutors and students. The various forms of data were analysed to determine factors that support and hinder learning for Maths GCSE resit students. This information was then used as a basis from which to design and develop the Maths GCSE resit support programme.

2.2.2 Addressing research aim 3

To report on changes in students' Maths GCSE grades following the implementation of the Maths GCSE resit support programme.

The project aimed to collect quantitative data relating to the Maths GCSE resit grades, pass rates and attendance levels for cohorts of students in each of the participating colleges, with a breakdown of data for NCOP and non-NCOP students. For each Maths GCSE resit student the following data (relating to the 2015/16, 2016/17 and 2017/18 academic years) was sought:

- Maths GCSE grade on entry to college.

- Maths GCSE resit grade at the end of the academic year.
- Level of attendance at Maths GCSE resit classes.
- Whether student was identified as NCOP or non-NCOP.

This data would have enabled comparisons to have been made between the GCSE pass rates pre- and post- the implementation of the Maths GCSE resit support programme, and to determine whether student attendance at Maths lessons impacted on their attainment in Maths GCSE resit examinations. However, in our endeavour to collect this data, it became apparent that most of the colleges did not collect or record such information. After much liaising with the college SLN NCOP coordinators, and some of the coordinators going to great lengths to manually extract the data from college records that did exist, only the following, very limited, data was forthcoming:

- three of the four colleges had data relating to individual students' Maths GCSE grades on entry to college and their resit grade at the end of the academic year for the 2017/18 academic year;
- two of these colleges had data relating to individual students' Maths GCSE grades on entry to college and their resit grade at the end of the academic year for the 2016/17 and 2015/16 academic years; these two colleges also had data relating to individual students' level of attendance at GCSE Maths resit classes for the 2017/18 academic year.
- In all cases, data was broken down into NCOP and non-NCOP students.

The available data was analysed to determine changes in NCOP and non-NCOP students' Maths GCSE grades for each of the three academic years (2015/16, 2016/17 and 2017/18), and consideration was given to the influence of student attendance at Maths GCSE resit lessons on their attainment in their Maths resit examination.

2.3 Methodological challenges and dilemmas

2.3.1. Methodological challenges

Methodological challenges arose in relation to the limited qualitative data available, as highlighted in 2.2.2 above. There were additional challenges around making comparisons between the entry and exist grades of GCSE resit students as the GCSE Maths specification and the grading system for GCSEs changed during the period of the project. In September 2015 the new GCSE Maths specification, which included additional subject content and was considered to be 'more demanding' (Gove, 2013) was available to teach, with the first assessment of this new specification GCSE taking place in June 2017. The final resit opportunity for the old specification Maths GCSE examination was also in June 2017. Thus, while all schools and colleges needed to be teaching to the new specification in the 2017/18 academic year, they could choose whether to teach to the new or the old specification during the 2016/17 academic year. This naturally presented challenges when trying to compare data relating to changes in Maths GCSE grades, especially as some of the participating colleges were teaching to the new specification and others teaching to the old specification during the 2016/17 academic year. It also meant that in the 2017/18 academic year, some tutors were teaching to the new specification for the first time, while others were more confident about teaching to the new specification as it was their second year of teaching this.

In addition to the new Maths GCSE specification, a new grading system for GCSE exams was introduced. The old specification Maths GCSE continued to be graded A* - G as it had been for several years, with grades A* - C being classed a GCSE pass. However, the new specification GCSE is graded 9-1, with 9 being roughly equivalent to an A*, and Grade 4 or above being classed as a GCSE

pass. These changes presented further challenges in making comparisons between differences in GCSE grades as some students entered colleges with a Maths GCSE grade from the old, A*-G grading system, and were then graded 9-1 in their Maths resit exam.

Furthermore, there were some inconsistencies in the available data, these include:

- Some students studying for their GCSE Maths resit exam were not entered for the exam. This tended to happen in cases where Maths tutors considered a student was not ready to achieve a GCSE pass *and* the student planned to continue their study at the college for at least another year (therefore could resit Maths GCSE the following year when they may have more chance of achieving a pass).
- A small number of students over the ages of 18/19 who were studying for their Maths GCSE resit exam were included in the figures made available by some of the colleges.
- Some students who previously studied for a Functional Skills Maths qualification were included in the Maths entry and GCSE resit data, even though their mathematical achievement was significantly below the level expected to be entered for a GCSE resit exam. Historically, these students would not have been required to study for the GCSE Maths. Thus, since the requirement for all students who have not achieved a pass in GCSE Maths to continue studying the subject until the age of 18/19 if they are receiving 150 or more hours of education, more students are being entered for the maths GCSE examination, even where there is little chance of them passing.

2.3.2 Methodological dilemmas

The researchers were faced with the ethical dilemma about whether to invite only identified NCOP students to take part in the student focus groups, thus singling them out and putting them in a position of potentially being faced with questions from other students about why they had been chosen to participate in the study at the exclusion of other students, or inviting all students to participate in the focus groups and risk no NCOP students participating. A decision was made to open the interviews to all Maths GCSE resit students. Fortunately, all students in some classes volunteered to participate and, in all cases, even where whole classes did not participate, all focus groups included at least some identified NCOP students. Thus, the views represented in this report relate to both NCOP and non-NCOP Maths GCSE resit students, however, no discernible difference was found between the views of these two groups.

3. Activities undertaken during the first stage of the University of Brighton's School of Education Maths GCSE resit project

The first stage of the Maths GCSE resit project ran from October 2017 to December 2018. During these 15 months the following activities took place:

- Identified college Maths tutors to participate in the project.
- Identified the specific professional development needs of individuals and teams of Maths GCSE resit tutors.
- Collected qualitative data to determine the perceptions of Maths GCSE resit tutors and students about factors that support and those that hinder Maths GCSE learning.
- Designed and lead bespoke professional development programmes to support college Maths tutors.
- Designed a new SoW, lesson structure, and resources to support the teaching of GCSE Maths resit students.

- Collected quantitative data relating to the Maths GCSE grades and attendance levels of Maths GCSE resit students.

The cycle of identifying Maths GCSE resit tutors' professional development needs, ascertaining Maths GCSE resit tutors' and students' perspectives of what supports and hinders Maths learning, and drawing on the pedagogical and subject expertise of the UoB's Maths specialist team to create bespoke professional development support continued for the duration of the first stage of the project. Findings from this stage of the project also informed the second stage of the project which will run from January to July 2019.

Further details of the research and professional development work conducted in the first stage of the project are detailed below.

3.1 Identifying college Maths tutors to participate in the project

Following positive responses from senior staff at four of the FE colleges across Sussex who indicated a willingness to participate in the project, it was necessary to identify individual Maths tutors who were interested in participating in the project and benefitting from the support offered by the UoB's School of Education Maths specialist team. Several Maths GCSE resit tutors were keen to be involved and very positive working relationships between the Maths tutors and the UoB's School of Education project team developed. In some cases, however, building positive working relationships with tutors took longer than anticipated. This was primarily due to three key factors:

i) As the GCSE Maths resit project did not start until October 2017, rather than at the beginning of the academic year, college Maths teams had already planned programmes of work for the academic year and were concerned that any intervention from the project might disrupt these plans.

ii) Some college Maths tutors had previous negative experiences of interventions and support which meant that they were initially defensive and resisted the offer of working with the UoB's School of Education Maths specialist team. They were suspicious about the motives behind the offer of 'free' support and were concerned that the project was aimed at negatively judging their teaching and/or with imposing solutions that may be '*overly theoretical and impractical in the real world*'. Some tutors specifically asked if the Maths team had connections with Ofsted, and some informed the project team that previous training which they had been advised to attend had been led by '*people who do not understand the issues that we are dealing with'* and '*who don't understand that the strategies wouldn't work with our students'*.

iii) In a small number of cases, the Maths GCSE resit project had been presented to college Maths tutors as support for inadequate or poor teaching, rather than as an opportunity to work with an expert Maths team who were willing to support Maths GCSE resit tutors and students in whatever way the Maths tutors considered would be most beneficial to them. In such cases, college Maths teams viewed the support project as another form of assessing tutors' performance, and tutors were initially opposed to becoming involved in the project.

Once the college Maths tutors understood the aim of the project and realised that the UoB's Maths specialist team comprised of experienced Maths lecturers who had very recent experience of teaching Maths GCSE students within similar catchment areas, positive mutually respectful working relationships developed. All college Math's tutors who had originally been apprehensive about being involved were fully engaged and keen to participate in the project. The college-based SLN NCOP coordinators offered significant support in acting as intermediaries between the project lead and liaising with their college Maths teams to explain the project aims and approach. This enabled the

college Maths subject teams, the UoB Maths specialist team and the researchers to work together to jointly identify areas of concern to Maths GCSE resit tutors and students, and to start developing possible solutions.

By the end of the 2017-18 academic year, the UoB Maths team and researchers had worked with 14 of the senor leaders from the colleges, including Directors of Curriculum and Heads of Maths, and with 46 Maths GCSE resit tutors.

3.2 Identifying the specific professional development needs of individual and teams of Maths GCSE resit tutors

While the specific professional development needs of the college Maths GCSE resit tutors varied across the colleges, it was possible to classify their identified needs into common themes. Following interviews and conversations with individual and teams of Maths tutors, and with curriculum leads and other senior members of staff within the colleges, the identified professional development needs of Maths GCSE resit tutors were to support Maths tutors to:

- Become more familiar and confident with the new Maths GCSE syllabus.
- Increase subject knowledge and confidence in teaching Maths (especially in the case of less experienced Maths tutors).
- Develop SoW to meet students' needs, rather than trying to cover the whole syllabus with all students and repeating topics in which many students already feel confident.
- Devise ways of measuring student progress and differentiating work for students of different abilities.
- Analyse students' answers to past GCSE examination papers to identify trends, strengths and gaps in knowledge, and develop diagnostic analyses for individual, class or cohorts of students (depending on Maths tutors' preferences) to enable this information to be used to set future homework and inform lesson planning.
- Improve behaviour management skills.
- Develop effective questioning to challenge students.
- Develop creative, exciting starters for lessons.
- Develop strategies to improve students' basic numeracy.
- Help students to develop an exam strategy to help raise achievement and lower anxiety.
- Implement measures to:
    - increase Maths GCSE resit students' mathematical literacy and confidence in their ability in Maths;
    - increase levels of student engagement;
    - develop programmes of work for low attainers;
    - prepare students, including increasing their confidence, for taking their Maths GCSE resit examination, especially in cases where students have had more than one previous attempt at the examination;
    - enhance students' revision skills.

GCSE Maths tutors also stated that they would like:

- To observe members of the UoB's School of Education Maths specialist team model lessons for them to observe and discuss.
- To be observed by a member of the Maths specialist team. However, tutors specifically stated that they did not want formal written feedback on these observations; their preference was for confidential, informal conversations between the observer and the tutor following an observation.
- Opportunities to share best practice with Maths GCSE resit tutors from other colleges.

3.3 Qualitative data relating to Maths GCSE resit tutors' perspectives of what supports and what hinders Maths GCSE resit students' learning

3.3.1 Factors that facilitate students' learning, as identified by Maths GCSE resit tutors

The following were identified as facilitating students' learning by Maths GCSE resit tutors:

Being able to identify, and address, where students' mathematical misconceptions create barriers to understanding. Maths tutors considered that if students were to progress in Maths it was essential to identify and address individual students' misconceptions about mathematical concepts. However, some Maths GCSE resit tutors acknowledged that, even where such concepts could be identified by individual diagnostic testing, addressing these misconceptions was not always easy due to large class sizes and limited time to spend with individual students during Maths lessons.

Short Maths lessons once or twice per week. Maths tutors identified that where Maths lessons were relatively short (approximately one – two hours) and occurred two to three times per week, this led to students being more able to concentrate for the whole Maths lesson (as opposed to lessons of three hours duration that were too long to hold students' concentration). Furthermore, having Maths teaching spread over two short lessons on different days led to students retaining information more readily than was the case when they had only one (more lengthy) lesson per week.

Ensuring students are prepared for the new specification Maths GCSE examination. Tutors considered that where students were supported to feel confident about the new Maths GCSE specification this led to students feeling relatively more motivated and confident about their ability to be able to achieve a pass in the subject.

3.3.2 Barriers to teaching and learning identified by Maths GCSE resit tutors

Barriers to teaching and learning identified by Maths GCSE resit tutors were identified as:

'Maths anxiety', low attendance, disengagement and lack of motivation amongst students. These factors were often inter-related, for example, where students had failed a Maths GCSE exam they felt demotivated and this often led to disengagement and poor attendance. Aligned to this, Maths tutors felt anxious and under pressure to improve the results of students who were resitting their Maths GCSE.

Maths GCSE resit lessons being perceived by students as a punishment. Related to the above point about student disengagement/lack of motivation in Maths, it was common for Maths GCSE resit tutors to cite measures taken by colleges to increase student attendance in Maths' GCSE resit lessons as contributing towards students viewing Maths GCSE resit lessons as a form of punishment. As stated by one Maths GCSE resit tutor, '*Students are told that if they don't attend Math lessons you get kicked off the course, so Maths is seen as something they have to do if they want to do their vocational course, no one explains to them that Maths might be valuable'*.

*Students being 'pushed' into Maths GCSE programmes of study which are not appropriate for their stage of development in Maths***.** Maths tutors voiced concerns about schools increasingly focusing attention on borderline pass/fail GCSE Maths students and putting extra resources into supporting these students to achieve a Maths GCSE pass. Thus, when entering college those students for whom no additional support was given whilst at school tend to find Maths GCSE difficult and have low achievement levels in the subject when compared to other students. Furthermore, prior to government policy prescribing that the minimum benchmark for Maths is now a GCSE pass, those students who were not considered ready or academically able to achieve a pass would have been encouraged to gain a Functional Skills Maths qualifications, however, these students '*are now being pushed towards a GCSE course that may not necessarily be appropriate for their stage of development in Maths'*.

Lack of confidence in teaching Maths GCSE. Due to a shortage in the availability of specialist Maths GCSE tutors within some of the colleges, there were some instances where non-specialist Maths

tutors were teaching Maths GCSE resit students, and other instances where specialist Maths tutors had experience of teaching Maths A-level and/or Functional Skills but not Maths GCSE. In both cases many of these tutors lacked confidence in teaching Maths GCSE resit students. Additionally, some experienced Maths GCSE resit tutors lacked confidence in their ability to teach the requirements of the new Maths GCSE specification.

Lack of support from vocational tutors about the relevance of Maths to their subject. Several tutors commented that vocational tutors within their college did not always see the relevance of Maths within their subject area and, as a result, did not help students understand the connections between Maths and their vocational subject.

3.4 Qualitative data relating to Maths GCSE resit students' perspectives of what supports and what hinders their Maths GCSE resit learning

3.4.1 Factors facilitating students' learning identified by Maths GCSE resit students

The following were identified as facilitating learning by Maths GCSE resit students:

Practicing/completing past Maths GCSE examination questions. Students commented that, although they often understood many of the necessary mathematical concepts needed for Maths GCSE, applying them in the context of GCSE questions often proved challenging, '*It's practicing answering questions that we need. Getting familiar with the sort of questions we need to answer… and knowing how to answer them'.*

Tutor encouragement and praise. Students wanted to receive praise from tutors when they competed work to a high standard and when they had put a lot of effort into completing a piece of work, and they felt demotivated when this did not happen. As one student commented *'I put so much into some of the homework, I didn't get it all right, but I really tried, and it hasn't even been marked, it's like it didn't matter… I don't really see the point any more, no one bothers if you put effort in or not*'.

1-1 support from Maths tutors. It was common for students to cite individual support from Maths tutors as being crucial for their learning for the Math GCSE resit exam. Students commented that areas in which they lacked mathematical understanding were often individual to them and, without 1-1 support around these specific issues, their learning did not progress. This view was summed up by one student who stated *'There are some bits I just don't get, and when he [the Maths tutor] goes through stuff in front of the class he doesn't always concentrate on the bit I don't understand cos everyone else gets that bit… I need him to go through it with me until I understand it, I need to ask the questions I need to ask about the bits I don't understand and you can't do that when he's just talking to the whole class cos everyone gets fed up with you, I need him sitting beside me and explaining it until I get it'*.

Tutors being aware of the areas of Maths on which to focus attention. Students considered it to be a waste of time when Maths tutors attempted to go through the whole Maths GCSE syllabus, including areas they were knowledgeable and confident about. Instead, they preferred tutors to identify, and inform them about, areas of Maths in which they were weak and to provide Maths exercises relating to these. *'It's good when you know which area of Maths you're targeting and how you can work on an area you're not good at…that way you don't waste time going through the things you can already do'*.

3.4.2 Barriers to learning identified by Maths GCSE resit students

Barriers to learning identified by Maths GCSE resit students were identified as:

Maths lessons being too lengthy. Where Maths lessons lasted for more than two hours students commented that their concentration could not last for this length of time. Several students made comments such as *'The lesson is too long, you can't concentrate for three hours, it's so boring*'.

Maths classes being too large. Students identified a class size of approximately 10 as the optimum size, with classes of 20 resulting in them getting too little support from Maths tutors.

Lack of interest in Maths. It was common for students to cite their lack of interest in Maths as being due to the fact that they did not need a pass in the subject, or have knowledge of the subject content, for their future career. As one student stated, '*We're only doing Maths because we've got to…most of us don't need Maths to do the jobs we want to do'*, and another commented '*I don't care if I don't get Maths, I don't need it*'.
In some cases the timing of Maths lessons contributed to students' lack of interest in the subject. For example, for some students Maths was held on a day when they had no other lessons and students resented having to go into college for their Maths lesson - '*On Mondays we only do Maths, not our actual subject so we've got to come in just for this, and it's not what we want to do'*. In other cases, students' resentment around Maths lessons related to the fact that the lessons started at 9am (while lessons on other days relating to their vocational study started at a later time) which meant that it was more expensive to take public transport at times which allowed them to arrive at the lesson on time.
Lack of confidence in their Maths ability. Students often lacked confidence in their own ability in Maths, assuming that they were unlikely to pass their GCSE resit. As one student working toward their third resit asserted, '*Why would I pass this time if I've not passed before?*'

3.5 Designing and leading bespoke professional development programmes to support colleges Maths tutors

Drawing on the professional development needs identified by individual Maths GCSE resit tutors and teams, and the facilitators and barriers identified by the tutors and Maths GCSE resit students, the UoB Maths specialist team developed various forms of professional development for whole Maths teams, as well as for individual tutors, within the participating colleges. These main forms of professional development are detailed below.

3.5.1 Professional development days hosted by the University of Brighton's School of Education

Where professional development days were held, a 'Train the Trainer' approach was adopted to enable Maths tutors to support other Maths tutors in their college to benefit from the work covered during these days.

During the first three professional development days practical strategies for raising students' basic numeracy skills were explored and consideration given to how research from cognitive science into learning could be applied in practical ways in Maths classrooms. Two additional professional development days were then designed and run for whole Maths teams to support co-constructing a new Maths GCSE resit Scheme of Work (SoW), a lesson structure that utilised Rosenshines Principles of Instruction (Rosenshine, 2012, 12) and strategies to boost student learning and retention (Dunlosky, Rawson et al., 2013, 533).

The co-constructed SoW and lesson structure were further developed by the UoB's School of Education Maths specialist team in July/August 2017. These were then launched with the college Maths teams at a follow-up professional development day held at the start of the 2018/19 academic year. GBMeT, and Central Sussex and Chichester College, have fully adopted the new SoW and lesson structure, and Sussex Downs College and Sussex Coast College Hastings are integrating elements of these into their existing Maths GCSE resit programme of work. Initial feedback from the college Maths tutors who have adopted the SoW and lesson structure has been extremely positive. The Maths specialist team are currently working with college Maths tutors to support and adapt the SoW and lesson structure to ensure these align exactly with the needs of each individual college. A further professional development day was held for college Maths teams to feedback and discuss

their experiences of using the SoW and lesson structure and to share best practice, and other days are planned for the spring and summer terms. The UoB's School of Education Maths specialist team have also developed a range of quizzes, tests and homeworks to support tutors to deliver the new SoW and lesson structure.

3.5.2 Bespoke professional development sessions and days run at individual colleges

During the 2017/18 academic year bespoke professional development sessions and days were designed and run at individual colleges. These focused on specific areas that college Maths GCSE resit tutors and teams had identified as areas in which they would like support. The UoB's Maths specialist team also worked with individual and teams of Maths GCSE resit tutors in all of the participating colleges, using a coaching model to provide bespoke professional development based on their self-identified needs.

3.5.3 Observation of, and feedback to, individual Maths GCSE resit tutors

Members of the UoB School of Education's Maths specialist team conducted developmental observations of, and provided confidential feedback to, college Maths GCSE resit tutors. Some observations were conducted jointly with members of the college quality assurance and/or senior leadership teams where college senior leaders/Maths tutors requested this. In total, more than 25 Maths GCSE resit tutors have been observed (in many cases, on more than one occasion). In all cases, feedback and intensive 1:1 support was given to advance aspects of tutors' Maths GCSE resit teaching. The Maths specialist team also delivered model Maths lessons in colleges to demonstrate good practice.

3.5.4 The development of resources available through an online resource hub

The UoB's Maths specialist team created several bespoke resources based on individual college and tutors' requirements and made these available to all Maths tutors in the participating colleges through and online resource hub. This hub also provides a facility for the Maths' tutors to share other resources they consider to be effective.

3.5.5 Provision of bespoke diagnostic testing for Maths tutors for use with Maths GCSE resit students

The Maths specialist team developed bespoke diagnostic testing tools for use with Maths GCSE resit students in the colleges. Where college Maths teams requested, the UoB Maths team also analysed the results and suggested ways forward for colleges to work with their Maths GCSE resit students.

To date, the UoB Maths team have worked with 12 Maths GCSE resit tutors to develop bespoke diagnostic testing.

3.6 Qualitative data relating to the Maths GCSE grades and attendance levels of Maths GCSE resit students

3.6.1 Number of Maths GCSE resit students reached by the project

Data gathered from the participating colleges indicated that significant numbers of NCOP and non-NCOP Maths GCSE resit students were, and are being, reached by the project[5].

[5] A student was considered to have been reached by the project where their Maths tutor had undergone one or more forms of professional development as part of the Maths GCSE resit project.

Academic year	Total number of students	Number of NCOP students	Number of non-NCOP students
2017/18	2460	511	1949
2018/19[6]	2856	761	2095

Table 1: To illustrate the number of NCOP and non-NCOP Maths GCSE resit students reached by the Maths GCSE resit project.

Table 1 illustrates that in the 2017/18 academic year 2460 students were reached by the project; of these, 511 were NCOP and 1949 non-NCOP students. With regard to the 2018/19 academic year, we estimate that 2856 Maths GCSE resit students are being reached; of these, 761 are NCOP and 2095 non-NCOP students.

3.6.2 Overview of changes in Maths GCSE resit pass rates for NCOP and non-NCOP students for the 2015/16, 2016/17 and 2017/18 academic years

Academic year	Total number of students	Total number (and %) of passes[7]	Number of NCOP students	Number (and %) of NCOP passes	Number non-NCOP students	Number (and %) of non-NCOP passes
2015/16	1628	601 (37%)	337	102 (30%)	1291	499 (39%)
2016/17	2048	416 (20%)	477	76 (16%)	1571	340 (22%)
2017/18	2460	337 (14%)	511	43 (8%)	1949	203 (10%)

Table 2: To illustrate changes in the Maths GCSE pass rates of NCOP and non-NCOP students across the colleges for the 2015/16, 2016/17 and 2017/19 academic years.

Table 2 above illustrates that over the past three academic years the number of both NCOP and non-NCOP students resitting Maths GCSE across the participating colleges has gradually increased from:

- 1628 students (337 NCOP, 1291 non-NCOP) in the 2015/16 academic year; to
- 2048 students (447 NCOP, 1571 non-NCOP) in the 2016/17 academic year; and
- 2460 students (511 NCOP, 1949 non-NCOP) in the 2017/18 academic year.

However, the total number and percentage of NCOP and non-NCOP students achieving a pass in their GCSE Maths resit has gradually decreased, with:

- 30% of NCOP students (n=102) and 39% of non-NCOP students (n=499) achieving a Maths GCSE pass in 2015/16;
- 20% NCOP (n=416) and 16% of non-NCOP students (n=76) achieving a pass in 2016/17; and only
- 14% of NCOP (n=337) and 8% non-NCOP students (n=43) achieving a pass in 2017/18.

Although lower percentages of NCOP students, when compared with non-NCOP students, achieved a pass in their GCSE resit exam for each of these years, there has been a gradual decrease in the percentage gap between NCOP and non-NCOP students passing their Maths GCSE resit exam.

[6]Please note these figures are 'best guesses' as it is not clear whether figures provided by colleges include a small number of students who fall outside of the 16-19 age bracket.

[7] A GCSE pass was considered to be achieved where a student gained a GCSE Grade C or GCSE Level 4 or above.

Findings indicate that:

- 9% fewer NCOP than non-NCOP students achieved a pass in their Maths GCSE resit in 2015/16;
- 6% fewer NCOP than non-NCOP students achieved a pass in their Maths GCSE resit in 2016/17; and only
- 2% fewer NCOP than non-NCOP students achieved a pass in their Maths GCSE resit in 2017/2018.

3.6.3 Changes in NCOP students' Maths GCSE grades between beginning and end of academic years

Very limited data was available relating to the Maths GCSE grade of individual students on entry to college and their Math GCSE resit grade at the end of the academic year. The data that was available was not easily accessible and required the SLN NCOP coordinators to extract the data from large data sets. Given these difficulties, it was only possible to obtain data relating to NCOP students over the past three academic years (rather than both NCOP and non-NCOP). The table below captures data from the three colleges which provided data relating to the Maths GCSE entry and resit grades for individual students for the 2017/18 academic year, as well as data from two of these colleges which provided data relating to the Maths GCSE entry and resit grades for individual students for the 2016/17 and 2016/16 academic years.

Academic year	**Number of NCOP students for whom Maths GCSE grade at beginning of academic year and resit grade are known**	**Percentage achieving higher grade at end of academic year**	**Percentage achieving the same grade at end of academic year**	**Percentage achieving lower grade at end of academic year**
2015/16	153	38% (n=58)	39% (n=59)	23% (n=36)
2016/17	169	31% (n=52)	45% (n=76)	24% (n=41)
2017/18	334	35% (n-115)	45% (n=151)	20% (n=68)

Table 3: To illustrate numbers and percentages of NCOP students for whom Maths GCSE college entry grades and resit grades are known.

Table 3 illustrates that the percentage of NCOP students achieving a higher Maths GCSE grade in their resit exam (than the grade they achieved in their previous attempt) has fallen slightly between 2015/16 and 2017/18.

- Of the 153 NCOP students for whom data was available for 2015/16, 38% (n=58) achieved a higher grade in their resit exam and, of the 334 NCOP students for whom data was available for 2017/18, 35% (n=115) achieved a higher grade.
- The percentage of NCOP students achieving the same grade in their resit exam increased slightly over these years, with 39% (n=59) of students achieving the same grade in their resit exam in 2015/16 and 45% (n=151) of students achieving the same grade in their resit exam in 2017/18.
- The percentage of NCOP students achieving a lower grade decreased slightly over the three years, with 23% (n=36) students achieving a lower grade in their resit exam in 2015/16 and 21% (n=68) achieving a lower grade in their resit exam in 2017/18.

It should also be noted that for each of these year groups, some data relating to larger numbers of NCOP students was available but either entry or resit grades were missing, making it impossible to include data relating to these students in table 3 above; this was the case for 48 students in the 2015/16 academic year, 76 students in the 2016/17 academic year, and 126 students in the 2017/18 academic year.

3.6.4 Impact of student attendance on Maths GCSE resit grades

The attendance data available for Maths GCSE resit students was limited to only two of the colleges and related to the 2017/18 academic year only, thus a full picture of the impact of attendance at Maths GCSE resit lessons on Maths GCSE resit students' achievement cannot be ascertained. Due to this limited data set, and the fact that no significant difference was found between NCOP and non-NCOP students in terms of the impact of attendance on Maths GCSE resit grades, findings reported here relate to the collective attendance data for both NCOP and non-NCOP students.

Percentage attendance at Maths GCSE resit lessons	**Total number of students (and % of these 534 students)**	**Number of students achieving a higher GCSE grade at end of academic year (and % of these 162 students)**	**Number of students achieving the same GCSE grade at end of academic year (and % of these 249 students)**	**Number of students whose GCSE grade was lower at end of academic year (and % of these 123 students)**
100%	8 (1%)	3 (2%)	5 (2%)	0
80%-99%	233 (44%)	94 (58%)	97 (39%)	42 (34%)
65%-79%	134 (25%)	39 (24%)	66 (27%)	29 (24%)
51%-64%	91 (17%)	21 (13%)	45 (18%)	25 (20%)
50% or below	68 (13%)	5 (3%)	36 (14%)	27 (22%)
Total number of students	534	162	249	123

Table 4: To illustrate the impact of attendance on changes in Math GCSE resit grades over the 2017/18 academic year

As illustrated in Table 4 above, attendance data that could be cross referenced with the Maths GCSE entry and resit grades of individual students was available for 534 students in the 2017/18 academic year. Of these students, 162 (30 %) achieved a higher GCSE grade in their Maths resit exam when compared to their previous GCSE grade; 249 students (47%) achieved the same grade; and 123 students (23%) achieved a lower grade in their Maths resit exam.

Overall, findings suggest that where Maths GCSE resit students' attendance rates at Maths GCSE resit classes was 80% or higher, students were more likely to achieve a higher GCSE resit grade, and where attendance rates were 50% or below, students were most likely to achieve a lower GCSE grade in their Maths resit exam.

Broken down further the data indicates:

- Of the 162 students who achieved a higher grade in their GCSE resit exam, 60% (n=97) attended at least 80% of their Maths lessons, 24% attended between 65% and 79% of the lessons, and 16% (n=26) attended 64% or fewer maths lessons. This suggests that higher levels of attendance at maths lessons is more likely to lead to higher GCSE resit grades.
- Of the 249 students who achieved the same grade in their Maths GCSE resit exam, 40% (n=102) had attendance levels of 80% or above, 27% (n=66) had attendance rates

between 65% and 79%, and 32% (n=81) had an attendance level of 64% or below, suggesting that there is slightly more chance of achieving the same grade, rather than a lower grade, where attendance levels are 80% or above.

- Of the 123 students who achieved a lower grade in their GCSE Maths resit, 34% (n=42) had an attendance rate of 80% or above, 24% (n=29) an attendance rate of between 65% and 79%, and 42% (n=52) had an attendance rate of 64% or below, suggesting that where attendance rates are lower, there is more chance of students achieving a lower GCSE grade.

Reasons as to why these statistics may not be as positive as may be expected (i.e. more students achieving a higher grade where attendance was of a high level) are detailed below in the Conclusion and final comments section.

5. Conclusion and final comments

Findings from this study indicate that percentage of Maths GCSE resit students who achieve a pass in their resit exam is gradually reducing. This can to some extent be accounted for by the national trend which suggests that average national pass rate for GCSE Maths resits dropped by 2.8% from 25.4% in 2017 to 22.6% in 2018 (Burke, 2018). Additionally, Speilman (2017) cited that less than a fifth of students managed to achieve a GCSE pass in Maths when they retook their GCSE and 'around two-thirds of students did not manage to improve their grade'.

When interpreting data relating to changes in students' Maths GCSE grades, and to the correlation between attendance at Maths GCSE resit lessons and a students' Maths GCSE resit grades, caution must exercised and it should be noted that it is not possible to draw conclusive findings from the available data due to the following reasons:

- Changes in government policy which dictates that all 16-19 year-old students in England undertaking a programme of study for more than 150 hours per year, who have not reached a minimum of Level 4 (Grade C) in GCSE Maths, must continue to study for an approved qualification in the subject until they reach this minimum level. Thus, rising numbers of students are now resitting Maths GCSE and students are often entered for the examination even where there is very little chance that they will pass this, whereas previously, these students would have been entered for Foundational Skills Maths, not GCSE Maths. This policy is 'causing significant problems' (Spielman, 2017), particularly for colleges where 'the conditions for funding can create an incentive to put students on resit courses that don't align well with their needs' (Ibid.).
- The new specification GCSE Maths examination, which involved students learning new material that may not have been previously covered when they first attempted Maths GCSE was introduced in 2015, with some colleges teaching to the new specification in 2016, and others starting to teach the new specification in 2017. Thus, differences between a student's Maths GCSE grade on entry to college and their GCSE resit grade may relate to two different programme specifications and be recorded using two different grading systems.
- Furthermore, due to the introduction of the new GCSE Maths specification, two different examination specifications were being used to measure changes in students' academic achievement.
- Some Maths tutors did not fully engage with the Maths GCSE resit project until several months into the 2017/18 academic year, thus, for these tutors that the impact of the

professional development support wok on students' Maths GCSE resit grades at the end of that year is likely to be limited.

- The impact of providing professional development and support for tutors does not always lead to immediate positive effects on student achievement. Rather, there tends to be more long-term impact as the interventions and support will impact on every student with whom a tutor works in the future. The professional development work undertaken in the 2017/18 academic year led to a SoW and lesson structure being jointly created by the college Maths tutors and the UoB School of Education's Maths specialist team. This has been implemented into the work of the participating colleges from the beginning of this (2018/19) academic year and, thus, has the potential to have a significant impact on the Maths GCSE resit results in the June 2019 exams.

Although Maths GCSE resit data does not indicate significant increase in the number of GCSE passes for reasons outlined above, the professional development and support provided by the Maths specialist team during the 2017/18 academic year has had very positive impact on Maths tutors.

5.1 Changes in Maths tutors' teaching practices as a result of the maths GCSE resit programme

Feedback from Maths tutors suggests that the Maths GCSE resit project has impacted positively on their teaching practice and tutors now:

- Give more consideration to/make more use of prior knowledge.
- Give more consideration to the quality of feedback.
- Make more use of diagnostic questioning.
- Make more use of available Maths resources.
- Have introduced more fluent starters to maths lessons.
- Give more consideration to the choice of resources/think more about resources to ensure they are fit for purpose.
- Have adopted improved questioning strategies.
- Use more challenging questions in lessons to engage learners.
- Encourage learners to think more about topics.
- Check more regularly for group understanding.
- Include more discussion in class.

The following quotes by Maths tutors further highlight the positive impact of the Maths GCSE resist project.

- *It's changed everything.*
- *I have re-adjusted my teaching by using new and different strategies* (shared by the UoB maths team).
- [Working with the UoB Maths team] *has led us to think in detail about our lesson structure and to try incorporating more diagnostic questioning.*
- *Provided a solid structure of lessons and planning.*
- *Improved teamwork and lesson delivery.*
- *I'm more confident in my delivery. Many more strategies and ideas to try.*
- *As a relative newcomer to teaching it has given me lot of guidance and ideas which I have been able to put into practice.*
- *Planning feels a lot more organised and having input from subject specialists like Emma and James is inspiring.*
- *The project has given us the chance to re-evaluate our teaching with input from external sources and discussion with other colleges.*

- *It's been great working with other colleges and sharing best practice and I know colleagues have rediscovered their love for teaching as a result of this new lesson structure.*

5.2 Maths tutors' perceptions of how the Maths GCSE resit project is likely to impact on students

Feedback from Maths tutors suggests that the Maths GCSE resit project will impact on students in the following ways:

- Improve numeracy skills.
- Improve motivation and engagement.
- Lead to deeper level of thinking and understanding, and greater retention of knowledge.
- Develop greater understanding of concepts rather than just methods.
- Enhance ability at problem solving skills.
- Lead to more active participation in lessons.
- Increase confidence.
- Enhance progress and attainment Maths.

The following quotes by Maths tutors highlight the positive impact of the Maths GCSE resist project on students:

- *They achieve more work in lessons, complete homework.*
- *Improved engagement, better behaviour in some areas.*
- *Improvement in basic numeracy.*
- *Because of the structure of lessons, students are more engaged.*
- *It's made me feel excited about outcomes and I love seeing improvement already in my learners.*

5.3 Maths tutors' responses to questions about whether aspects of the professional development activities had been of benefit to them

Maths tutors' responses to questions about whether any specific aspects of the professional development activities run by the UoB's School of Education Maths specialist team had been of benefit to them were overwhelmingly positive:

- *The input of new ideas…has been brilliant. Every session has been invaluable and had a direct impact on my teaching and learners.*
- *Overall, I feel the impact and benefit that I have received during these training session and CPD days through opportunities to share good working practice with other teachers, networking, sharing resource ideas etc.*
- *Observations (first time I have been observed by a Maths teacher in 4.5 years), CPD days (always good to speak to colleagues).*
- *Observations and feedback - constructive and positive. Far more impactful than observations I've had at the college previously.*
- *Been next to no other training I have had. It has had a huge impact on me as an experienced teacher. I am now looking at each lesson with a new angle.*
- *You [the maths' team] have been very inspirational. Much appreciated.*
- *I have re-adjusted my teaching by using new and different strategies* (shared by the UoB maths team).
- [Working with the UoB Maths team] *has led us to think in detail about our lesson structure and to try incorporating more diagnostic questioning.*

- *Working in FE can feel like the wild west at times, where 'normal' (school) rules (expectations) don't exist. The importance of this project is that you feel like your job and role is being taken seriously.*
- *The CPD events always leave us enthusiastic about improving our teaching. They are honestly the most worthwhile training days I've had as a teacher.*

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