



Improving the motivation and engagement of maths GCSE re-sit students in FE Colleges by using maths specialist tutors as mentors

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OUR PARTNERS



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About CfEM

Centres for Excellence in Maths (CfEM) is a five-year national improvement programme aimed at delivering sustained improvements in maths outcomes for 16–19-year-olds, up to Level 2, in post-16 settings.

Funded by the Department for Education and delivered by the Education and Training Foundation, the programme is exploring what works for teachers and students, embedding related CPD and good practice, and building networks of maths professionals in colleges.

Summary

This action research projects purpose and intention is tackling the attitudes and mind-set of resit GCSE Maths learners within the post 16 sector using maths specialist mentors. The project investigated the current barriers to learning and how the use of support inside and/or outside of the classroom might enable learners to build on their confidence in maths, their academic self-concept and attainment. Five post-16 institutions were involved across Greater London, with 4 maths specialist mentors and 8 peer mentors taking up the supportive role. These mentors targeted and supported 76 students across the entire intervention. A series of questionnaires completed by mentors and mentees as well as one to one interviews gave qualitative data towards the findings. Alongside this, 16-minute schedule lesson observations were used to formalise what happened and occurred during the session. Attendance and performance sheets were used to track learners participating in the programme.

The main findings are that half of the students being mentored improved their attainment by one grade in GCSE Maths. The average confidence level for the 76 students involved in this study increased by 16%, and attendance improved by 8%. The biggest gain was in motivation and engagement. All students felt more motivated and were more engaged than if they were not being mentored. This demonstrates that in terms of results, mentoring would be ideal for a student who is one grade away from passing. However, in terms of motivation and engagement, mentoring would be beneficial to all students.

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Background

Student attainment outcomes in mathematics are of increasing importance to individuals, colleges and society as successive governments seek to ensure that the UK workforce has sufficient quantitative skills for an increasingly data-driven and technology-enabled future. There is a growing expectation that young people continue their mathematics education beyond school into colleges and other Further Education (FE) providers. In 2015 the UK government applied the condition of funding for FE providers, so all students who fell short of a grade 4 GCSE at the age of 16, are now required to retake their GCSE or work towards improving their mathematics skills alongside their vocational courses and A Levels.

Nationally, approximately 40% of students don't achieve a grade 4 at school and of these, less than 1 in 5 students achieve grade 4 when resitting their GCSE Maths, within the post 16 sector. Furthermore, the more times students attempt the GCSE exam (they may retake the qualification twice a year), the less likely they are to pass. This cycle of 'failure' for approximately 80% of FE students each year has meant motivation and engagement are key factor in helping to embed a growth mind-set, overcome anxieties and develop resilience. For this reason, and following the literature review, we chose to use Maths specialist mentors to support the students with a view to help the mentees overcome their Maths anxiety and motivate/empower them to work through their difficulties in the subject. It turned out later in this study that just by feeling supported had a biggest impact on student motivation and engagement.

The Department for Education have funded a multi-million pound 'Centres for Excellence in Mathematics' project until March 2023 which is being managed by The Education and Training Foundation, a not-for-profit organisation which supports teachers and leaders across the Further Education and Training sector. Christ the King Sixth Form College is one of the 21 Centres for Excellence in Maths and they have been innovating, developing new, exciting ways to teach the fundamental mathematical concepts in the classroom, and using Math Mentors as a strategy to help motivate and engage learners outside of the classroom.

Literature Review

The aim of this literature review is to first explore the terminology, definitions and differences between tutoring, mentoring and coaching so that their distinctive qualities are understood. Many countries across the world have seen a large shift towards more private tutoring for students; some reasons for this will be discussed. The global pandemic of Covid-19 has meant that many governments, including the UK government, have funded catch-up programmes to support ‘missed’ learning. As with all interventions, it is important to remember that impact can only be witnessed with high-quality implementation. The literature review goes on to discuss evidence linking motivation and attainment to mentoring.

Definition of Tutoring Vs Mentoring

Bray and Kwok (2003) define private supplementary tutoring as *“tutoring in academic subjects which is provided by the tutors for financial gain, and which is additional to the provision by mainstream schooling”*. Their study focused on tutoring in Hong Kong, which tends to take place mostly in evenings, weekends and vacation times. This is different to our colleges, which are in London.

This definition is also confirmed by Tansel & Bircan (2006) who studied the broader implications and availability of private tutoring in Turkey such as household income, expenditure, parental education, and other household characteristics. This was the very first study of its kind in Turkey:

“Private tutoring can be defined as the education outside the formal schooling system where the tutor teaches particular subject(s) in exchange for a financial gain.”

It is often accepted that private tutoring is associated with one-to-one support with a tutor but can also be described to take place *“in small groups, in large classes, or even in huge lecture theatres with overflow rooms in which students watch on a screen...”* (Bray & Kwok, 2003).

Goodlad (2002), a currently retired professor at Imperial College London (also one of the leading founders of student tutoring in the UK), presented a paper of his research at the 2002 Mentoring Conference of the London Regional Mentoring Network, which included a clear outline of difference between the tutoring and mentoring models [Table 1]:

Dimension	Tutoring	Mentoring
Focus	Academic learning	Life skills
Location	Usually in a classroom	Often outside the classroom
Mode	One to several	One-to-one
Duration	A few weeks	Several months/years

Differences between tutoring and mentoring

Table 1: Goodlad.S (2002); Tutoring – The neglected partner?

Goodlad (2002) makes clear that the boundaries between the two are not rigid but are indeed important activities contained within each. For our students and so this particular CfEM action research, a combination of elements from both the Tutoring and Mentoring categories were thought likely to be useful. For example:

- the individual supporting students will be recruited to have the subject knowledge in Mathematics to be able to support students with their studies by going through exam papers and questions (Tutoring) but also be trained to support life skills such as time management, confidence building, well-being and overcoming math/exam anxiety (Mentoring)
- some sessions will take place outside of the classroom (Mentoring) while others will receive peer mentoring in class
- the sessions will be one to several – maximum 5 (Tutoring)
- the duration of the intervention will take place over the course of several months (Mentoring)

Fresko & Kowalsky (1998) seem to concur with Goodlad and also make similar direct comparisons between tutoring and mentoring in their study of the project PERACH; an Israeli nation-led project where university/college students work with school children identified by teachers or counsellors:

"Mentoring focuses on life skills, often takes place outside the classroom, involves a one-to-one relationship and lasts for a period of several months or even years. In comparison, tutoring concentrates on academic learning, is usually conducted in a classroom setting, involves a one-to-group relationship and takes place over a shorter period of a few weeks" (Fresko & Kowalsky, 1998, p. 4).

Figure 1, taken from Irby's issue of Mentoring and Tutoring (Irby, 2018) gives an overview of the three concepts of Mentoring, Tutoring and Coaching. Irby definitively suggests that *"mentors can coach, but coaches hardly ever mentor, and mentors and coaches can tutor, but tutors rarely mentor or coach"* (Irby, 2012, p. 297)

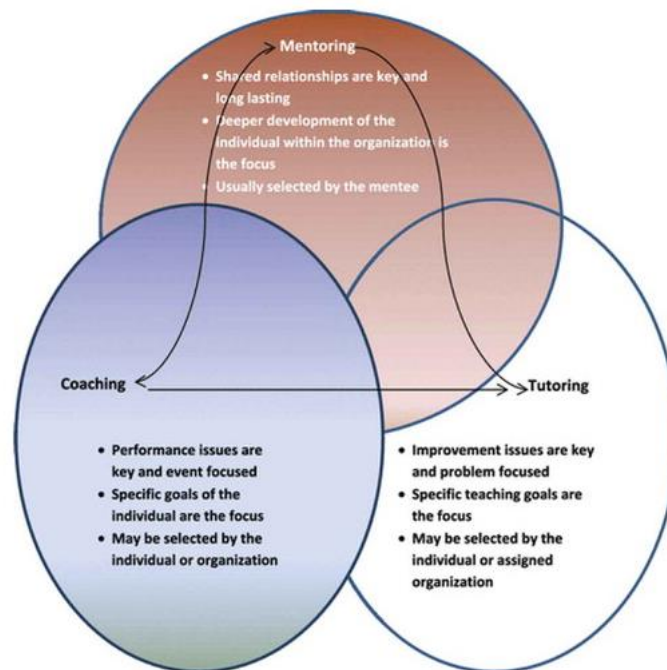


Figure 1. (Irby, Editor's overview: Mentoring, tutoring, and coaching, 2012, p. 297)

Sharp, Nikolaos, & Abrahams (2016) recognise the variation in the terminology used in literature but *“believe that the most appropriate term to describe the relationship between a more experience individual and a less experience one is that of ‘mentoring’ which includes helping mentees prepare for and achieve academic advancement”* (Sharp, Nikolaos, & Abrahams, 2016, p. 1).

Considering this, for the purposes of this action research the role will therefore be defined as a Mentor who also Tutors for resit GCSE Math students

High quality Implementation

- Training for tutors

Tutees whose tutors participated in ongoing, intensive training throughout their participation in a Dade County tutoring program outperformed tutees whose tutors did not complete the ongoing training sessions (Wasik & Slavin, 1993).

Reisner, Petry, & Armitage (1990) reviewed programs for disadvantaged elementary and secondary students that involved college students as tutors or mentors. This study has a very similar approach to some of mentors being used for this action research project; where mentors are undergraduate maths students recruited as mentors for college students. The review found that tutor training was key to the project's success:

“...generally, report that tutoring and mentoring services have positive effects on the test scores, grades, and overall academic performance of disadvantaged elementary and secondary students; their motivation and attitude towards education; their familiarity with

environments other than their own; and their self-esteem and self-confidence. They also report that project participation helps college students: obtain practical experience and improve their leadership and communication skills; develop a greater commitment to community service; and increase their self-esteem and self-confidence.”

(Reisner, Petry, & Armitage, 1990)

The importance of tutor training is also reinforced by several other studies, which provide specific advice on the types of training that yield the best results. Jenkins & Jenkins (1987) point to the importance of training in interpersonal skills so tutors do not become impatient with tutees. Warger (1991) states that training should include strategies for reinforcing correct responses and properly correcting incorrect responses.

- Frequency and length

Rigorous evaluations of tutoring programs reported positive results for programs whose tutoring sessions ran from 10 to 60 minutes in length, although longer sessions did not necessarily result in better outcomes (Warger, 1991); (Jenkins & Jenkins, 1987).

Tutoring programs in which tutors met with tutees at least three times a week were more likely to generate positive achievement for tutees than programs in which tutors and tutees met twice a week (Reisner, Petry, & Armitage, 1990).

Using Peer mentoring to reduce Mathematical anxiety

Research led by Imogen Cropp, university of Exeter has shown mathematical anxiety impacts on mathematical confidence and attainment, leading to avoidance of mathematics and mathematical careers. This research investigated if an intervention with peer mentors could help reduce students' mathematical anxiety. It took place at a Secondary School (11–18 years) in the South West of England, which has been rated as 'Outstanding' by Ofsted. Five female students (aged 11–15 years) identified by their teachers as mathematically anxious were paired with peer mentors (female, aged 16–17 years) to receive four one-hour intervention sessions over six weeks. The purpose was for the mentors to provide encouragement and demonstrate skills to cope with being 'stuck', thus building the students' mathematical resilience and reducing their mathematical anxiety. The students' mathematical anxiety and attitudes were measured with a questionnaire before the intervention and again after all four sessions. The qualitative data collected from the questionnaires was reported alongside data provided by semi-structured interviews, which was coded and analysed for common themes. Three out of five participants reported reduced mathematical anxiety and all five students demonstrated a positive attitude to the intervention. However, the findings were inconsistent regarding improved mathematical resilience and its effect on reducing mathematical anxiety.

Motivation

Motivation is seen as one of the most important aspects that educational practitioners can target to effect engagement and thereby improve student outcomes (Meece et al., 2006). This case study research, which took place in an above-average sized secondary school, aimed to investigate the perceived effect of learning mentor support on the motivation of those students in Year 11 receiving pupil premium funding. Questionnaires for twelve

students and seven teachers explored the impact of motivation on student outcomes; the role goal setting plays on student motivation; the benefit of mentoring relationships and how a learning mentor can support disadvantaged students and their motivation. A semi-structured interview with the Deputy Headteacher responsible for monitoring pupil premium within the school provided further insight into learning mentor effectiveness in improving motivation and the resultant effect on outcomes such as attendance, behaviour, and attainment. Documentary analysis of student progress data at two reporting points provided triangulation. Key findings indicated that learning mentors were effective in promoting student motivation and thereby positively affecting outcomes of attainment, confidence, homework and focus in lessons. Findings also suggested that participants viewed mentoring positively; it produced beneficial relationships. However, the findings for outcomes of attendance and organisation contrasted with key literature; it did not appear that learning mentors had a positive effect on these particular outcomes in this case study.

Solving the problem of low attainment in Maths

Every year almost 40 per cent of young people leave school without a 'good' level 4 grade in GCSE maths. This problem of low attainment in maths is one of the most persistent in education and is almost certain to get worse as a result of the lockdown measures currently in place.

Professor Jeremy Hodgen (June 2020) and his team at UCL IOE (Mathematics education) tested the evidence and identified the strategies most likely to close one of education's most persistent attainment gaps.

They published a report of this study, *Low attainment in mathematics: An investigation focusing on Year 9 students in England*, which was funded by the Nuffield Foundation. They examined how low-attaining year 9 students understand and progress across number, multiplicative reasoning and algebra. Are low-attainers on basically the same trajectory as other students, just a bit delayed, or do they have substantively different routes of progression through the curriculum? Most importantly, what can be done to support these students so that they progress in their learning of mathematics?

They developed a new computer-based test, designed specifically for low-attaining year 9 students, and, for comparison, also gave exactly the same test to year 5 middle and high attainers (almost 4000 students altogether). As you might expect, they found that the strongest factor associated with students' future attainment was their prior attainment, and this mattered more than things like gender, socioeconomic status and attitude.

They looked for evidence that there are particular concepts and areas of mathematics that are crucial determiners of future learning, but they found no magic bullets here. However, although they found some evidence that low-attaining students have some weaknesses in number and calculation, the study indicates that in general low-attaining year 9 students seem to have broadly similar mathematical profiles to the year 5 students that were tested, who were operating at a similar overall level of mathematics. The year 9 students were some four years or so behind their peers, but they were on the same mathematical path.

They found that most strategies that are effective generally are also effective for low attainers. However, it was found that explicit teaching is not a silver bullet, and the effect on attainment was found to be only of a moderate size. Indeed, a contrasting approach, student-centred learning was also found to be effective, with a similar size of effect, albeit with a much weaker and less-consistent evidence base. Research indicates that the strategy

of explicit teaching should be employed alongside other approaches, including problem solving and collaborative learning.

They also found evidence to support the use of early intervention for students at risk of low attainment. In general, the effect of an intervention reduced as the duration increased, although higher frequency was associated with increased benefits. They also found that support from teaching assistants to small groups can be effective when provided through structured programmes.

This study also suggested that interventions directed exclusively at increasing motivation or improving attitudes are less likely to be effective than interventions focused more directly on improving attainment.

Impact of Mentoring/Tutoring

A three-year longitudinal evaluation SSNEDP (MacBeath, Kirwan , & Myers, 2001) in the UK studied the impact of participation in study support (out of school hours learning) on academic attainment, attitudes and school attendance of secondary school pupils. DfEE (Department for Education and Employment) set up the programme between 1997 and 2000, tracking two cohorts totalling over 8000 pupils from 52 schools (the larger cohort from year 9 through to their GCSEs and the smaller cohort from Year 7 through to KS3 SATs).

The research found firm evidence in all schools' studies that pupils who participate in study support do better than would have been expected from baseline measures in academic attainment, attitudes to school and attendance at school. The study also appeared to show particular effectiveness for students from minority ethnic communities. Drop-in and subject-focussed study support in Year 11 had the biggest effect on attitudes, self-esteem and willingness to participate in class. Participation rates were dependent on whether schools had a whole school approach to study support, coordinated the provision through a senior member of staff and whether they offered a wide range of challenging and interesting activities. It is important to note, however, that this research compared students who did participate with those who did not participate in any extra activities. Students who do not participate are likely to differ from other students in many ways, however the report does not provide an analysis of the characteristics of these students (e.g. transport issues, external commitments, carers, out of school activities). Some of the study support sessions that focused on curriculum were very similar to certain forms of private tutoring. It seemed that the provision of such activities is especially beneficial for students from disadvantaged backgrounds whose families may not be able to afford private tutoring. Ireson (2004) who studied questionnaires of over 3000 students in Year 6, Year 11 and Year 13 saw that "*of the pupils eligible for free school meals, 19% had ever had a tutor, as compared with 28% of pupils who were not eligible*".

Similarly, Posner & Vandell (1999) in their study of after-school activities of 194 African American and White children from low-income households (3rd to 5th grade in the US) found children who attended such programs spent more time on academic and extracurricular activities than children who did not. This suggests that these students were motivated and engaged than students who did not participate in such activities.

Mischo & Haag (2002) compared students who did and did not receive small group tuition after school and found that tutoring raised academic self-concept, which in turn is beneficial to student achievement.

The UK government investment in Study Support, and the more recent 16-19 Catch Up Fund, represents a significant attempt to improve opportunities and participation of pupils from disadvantaged backgrounds. It implies that schools would do well to ensure that every child participates in at least one activity. One of the strengths of the programme is that attendance is voluntary meaning students are putting their own time and commitment into the sessions.

Through much research, it is evident that although achievement, attitudes and self-concepts are beneficial outcomes of tutoring, these are not guaranteed. Research findings regarding the effects on attainment are inconsistent, as well-controlled experimental studies demonstrate strong positive effects (Mischo & Haag, 2002) whereas international surveys do not (Baker, Akiba, Letendre, & Wiseman, 2001).

Conclusion

The literature review suggests that mentoring, rather than explicit teaching can have a positive impact on learners' motivation, attitude and attainment in Maths. Learners tend to respond positively to initiatives that they feel will actually help them achieve their target grade.

What this ongoing study has concluded so far

This study revealed in the previous 2 years that by offering small group mentoring/support inside/outside of the classroom (with the emphasis of growth mind-set language and support), the self-confidence of learners resitting the GCSE Maths qualification increased significantly. This in turn went on to show that a growth in confidence enabled learners to believe in their own academic 'ability' and self-concept. An overall impact of all of these findings combined was that attainment of these learners was suggestively better than those not being mentored, but only suggestively.

During this cycle we intend to measure the impact of mentoring on confidence in Maths and problem solving more rigorously, and the same for attainment. We will also investigate the difference between being mentored by a peer in the classroom during lessons versus being mentored by a professional adult mentor outside lessons in terms of learner experience, motivation, confidence, attainment.

Objectives

The key principles and objectives of the project are as follows:

1. To design a mentoring programme that can take place both face to face and online.
2. To investigate which aspects of the mentoring programme have the greatest positive impact on students' attitudes, and why?
3. To analyse whether the mentoring programme has an impact on student motivation, confidence (in Maths) and attainment.
4. To share results and, effective approaches, with GCSE maths re-sit teachers locally and nationally.

Methods

Mentors

The approach to recruiting the mentors differed across the five sites involved in this action research. Four of the eight mentors were adult mentors from a range of backgrounds such as being undergraduate Maths students through a contact (lecturer) at a local university, or part time teachers/teaching assistants who wanted more hours. They were recruited through an application and interview process. One of the mentors was an undergraduate in a different field from maths but who had a strong mathematical background with tutoring experience. The remaining 8 peer mentors were typically A Level Maths students who studied at the same college as the mentees and were the same age. Adult mentors held their mentoring sessions outside lessons so that the mentees still went to all their maths lessons, then attended an additional mentoring session with the adult mentor. While peer mentors joined their mentees into one of their maths lessons and supported them there.

It was important that all mentors received a comprehensive half-day training focusing on elements such as understanding and modelling a growth mind-set, being open and honest about the challenges students face and how they might approach these, different learning styles and scenario-based role-play. This had been created and delivered through the Centre Lead in earlier cycles using the understanding gained from the literature review with what high quality implementation should entail (Appendix A). It was important that training occurred before mentors had any contact with students. Peer mentors were trained face to face by the head of Maths, while adult mentors were trained remotely by the centre lead.

Participants

Students/Mentees were selected based on their entry grade together with their performance on a diagnostic test. Other students expressed interest in being mentored and were also welcomed into the programme. In total, 76 students were involved.

On average students were in groups of no larger than four or five per session. Session times would differ between participating colleges but an agreement of a minimum of 45 minutes was made. An attendance record was kept at each site for the mentoring session across the year.

Procedure

Participants were invited, to complete an online survey (Appendix B) prior to being mentored. Students were informed and approved to their participation, with an opening statement outlining ethical considerations, including anonymity, confidentiality and security with any data that was collected and/or stored. The survey included a mixture of both qualitative and quantitative data. This feedback gave us a background/overview of the participants involved, particularly their history of Maths, their attitude towards it and the difficulties they have with it.

Recorded interviews were used with both the mentor and the participants (Appendix C & D) at the end of the programme. This was to ensure the feedback, impact and points of view

from both parties were included, summarised and compared. We believed it would provide a useful insight into the dynamics of the relationship and sessions between mentor and mentee from both perspectives.

In addition to this, separate 16-minute observations (Appendix E) were made of the mentoring sessions at each site to witness what actions the mentor and mentees were taking every two minutes during the session. The observations would give an insight into how the mentoring sessions were conducted, what actions the mentor and mentee were taking and in what way the participant was engaged/participating.

In order to measure improvements in attainment confidence and attendance, students were given assessments prior to being monitored, their confidence level was measured using an agreed confidence scale (appendix F), and their attendance to Maths lessons was noted. At the end of the programme, students were given another assessment, their confidence level measured and attendance throughout the year noted.

Findings

Context

For this study, 76 students were mentored across 5 institutions. Each student had the opportunity to attend 1 mentoring session per week for around 20 weeks.

Motivation:

10 out of 76 students were sampled for interviews.

Table 2 (below) shows the learner journey before, during and at the end of the mentoring programme for a sample of five learners of the ten that were interviewed based on their own words describing their experience. All the quotes below are from their pre mentoring questionnaire (Appendix B) and interview at the end of mentoring (Appendix D)

Table 2: Student journey through mentoring, based on quotes from their interviews and questionnaires

Student Maths history before mentoring (interviews/ questionnaire)	Perception of mentoring before mentoring Questionnaire	During mentoring (Interviews)	Impact (interviews) At end of mentoring
'I did not understand many topics'	'Mentor can explain things in a different way from the teacher'	'Helped with problem solving and technical things such as fractions. Demonstrated examples explaining each step while asking me questions along the way to see if I understand and if I am following. He also helped me to break down questions.'	'I do feel different, especially wordy questions which I never understood before, and now I find them easy to do these.'
'I did not take Maths seriously, I felt I needed 1 to 1 support which was not available'	'I can get help without feeling pressured for holding back the class'	'I speak out more (in the small group) and ask more questions'	'My attitude improved, before I was so afraid to make mistakes, but now every time I make mistakes, I will learn from it.'
'I often struggled to understand, kept quiet in class and did not ask for help'	'Mentor can focus on me and 2 others, as opposed to a teacher in the class focussing on me and 20 others.'	'When teacher is busy with other students, the mentor helps me and because he is of a similar age as me, it facilitates communication, and I can ask him to skip explaining the bits that I know. I would feel too shy to say this to a teacher.'	'I was able to get help quickly rather than wait my turn with the teacher. He also uses simple language and is down to the point. Feels u can ask him to skip what I know and focus on what I don't.'
'I did not have confidence doing Maths on my own, or even with a teacher's help'	'Mentoring will give me more confidence and deepen my understanding'	'I try Q first, then call mentor when I need help. He does not give me the answer, he explains what I am doing wrong, and guides me till I get it right. He also sometimes explains topics that I do not get at all, such as speed and time.'	'It improved my confidence and encouraged me to try the next question. I felt comfortable with the mentor seeing my work knowing she will constructively help me.'

All students that were sampled gave similar responses to the 5 samples in table 2 (above) and had the same positive journey through the mentoring process.

All students that were sampled said that they were not motivated in Maths (prior to mentoring) for reasons such as there were parts/topics that they did not understand and they did not feel confident to ask their teachers in class for a variety of reasons, the most common being that they felt they would be holding up the class.

All students that were sampled perceived that mentoring would be beneficial as the mentor could focus on them, take time explaining certain topics and do more example or explain in a different way as needed.

All students that were sampled found the mentoring useful, supportive, positive and played out as they had perceived it.

All students that were sampled felt positive and motivated regarding Maths at the end of the programme (please see quotes in the impact column in Table 2).

Despite what activities or tasks were used, it was the interaction between the mentor and mentee that would give some suggestions about how the dynamics of the mentor-mentee relationship developed and what behaviours/actions were typically observed. Through the eight sixteen-minute observations conducted (see table 3 below), the time spent by the mentee producing written work is evenly balanced with the time the mentee is interacting with the mentor, which would suggest that the mentees are working through the session/activity whilst communicating or listening to their mentor when needed. Overall, learners are mostly 'doing' or 'producing' work during these sessions and are very much involved with the activities taking place. It is important that mentors are trained not to do all the work for the mentees, but to support and empower/enable the mentees to do the work themselves.

The observations (see table 3 below) also show the mentor giving verbal feedback, verbal encouragement, asking/answering questions, and giving explanations in almost equivalent amounts. It is important to identify verbal encouragement distinct from verbal feedback, in which the former focuses on growth mind-set and motivational language and the latter to academic feedback. A significant proportion of the training for mentors did focus on the use of positive language and reinforcement as GCSE maths students may need to help them build confidence. This finding may also suggest how the interpersonal skills of the mentor do play a vital role in quality implementation and behaviours that are needed by the mentor (Jenkins & Jenkins 1987).

Table 3: Activity log for 8 mentoring sessions (observed in the first 16 minutes)

MENTOR	Interaction Behaviour	Obs 1	Obs 2	Obs 3	Obs 4	Obs 5	Obs 6	Obs 7	Obs 8	Total
	Explaining	2	2	2	2	3	2	0	2	15
	Asking questions	1	1	1	2	2	1	3	2	13
	Giving verbal feedback	1	2	0	2	2	3	1	0	11
	Verbal encouragement	1	2	1	2	2	0	2	1	11
	Modelling	2	3	2	0	0	0	1	2	10
	Answering questions	2	2	2	0	0	2	0	1	9
	Doing nothing	0	0	0	0	0	0	1	0	1
MENTEE										
	Producing written work	4	4	3	6	4	4	2	2	29
	Listening to Mentor	4	2	3	2	3	2	4	4	22
	Asking mentor question	3	2	2	0	1	2	2	2	14
	Disengaged	0	0	0	0	0	0	0	0	0

Results from eight sixteen-minute observations of mentoring session

Context for attainment, confidence and attendance below:

<< Each student attended around 20 mentoring sessions in the space of 7 months following the COVID19 pandemic>>.

Attainment

Students were assessed at the start and at the end of the course and on average, each student went up by half a grade (GCSE 9-1). In terms of raw data, this means that half of the 76 students being mentored went up by one grade.

This shows an improvement by one grade for half the students being mentored.

Confidence

Each of the 76 students were given a confidence score by their teacher/mentor at the start and at the end of mentoring using the confidence scale which consists of 5 levels (please see appendix F) which was designed by the teachers participating in this study.

At the start, the average confidence score for each student was 2.2/5 (44%). At the end, after mentoring, the average score increased to 3/5 (60%). This is an increase of 0.8/5 (16%).

This shows an improvement in confidence.

Attendance

The average attendance to Maths lessons for each of the 76 students was 84% while the typical attendance of a GCSE Maths student is on average 77%

This shows an improvement in attendance.

Practicalities

In this study, 3 of the 5 colleges chose to mentor students using an adult mentor outside the classroom using adult mentors, while the remaining 2 colleges chose to use peer mentors (A Level Maths students) to mentor students in one of their actual GCSE lessons. Although students were positive about being mentored regardless of the setting or the type of mentor, table 4 below shows the advantages and disadvantages of each setting as found by this study.

Table 4: Advantage and disadvantages of different mentoring settings

Approach	Advantages	Disadvantages
Adult mentor outside classroom (once per week)	• Mentor will be available throughout the year. • Mentor can explore any topic in any sessions and switch between topics as needed. • Sessions can be run remotely	• Expensive (£20 per session) • Students may not be willing to attend an additional Maths lesson
Maths (A Level) Student mentor in the GCSE Maths lesson (Once per week)	• Can speak in simple 'teen age' language and the student is more likely to ask them to skip parts where help is not needed. • Student gets help in a lesson that he attends anyway (no need to attend an additional lesson) • The topic for mentoring can be suggested and guided by the teacher • Cheap (£8 per session)	• Peer mentors can withdraw from the process at any time, so there can be lack of continuity for the mentee • In the lesson, there can be brief interruptions to the mentoring process whenever a teacher wants to speak to the whole class.

It was difficult to measure which approach is best as the students were equally positive in both cases and there are other variables involved. I think both settings worked well because mentors were trained how to operate in their relevant setting. Ultimately it will be up to each institution to decide which setting suits them and their students best and be aware of the disadvantages of their choice.

Conclusions and Recommendations

Conclusions

Despite the pandemic and the fact that students only had only 20 mentoring sessions, there was still an improvement in attainment, confidence, and attendance. These improvements were modest possibly due to the low number of sessions in the academic year. However, the impact of mentoring on motivation, engagement, and mind-set was more significant, even with just 20 sessions.

This action research has provided some clarity and certainty around the impact mentoring can have on resit GCSE Maths learners, particularly on their attitude and mind-set. For example, the overwhelming evidence of growing and improving academic self-concept had a big role to play in how student felt or perceived their 'mathematical ability'. Mentoring provided the safe and trusting space where learners were able to ask questions that they, self-admittedly, would not do in a classroom setting. It would be appropriate to assume that by being heard, listened to, empowered and supported one to one or in small groups by a mentor caused a significant shift in their self-declared confidence before and after mentoring (Mischo & Haag 2002). This in turn changed some of their behaviours (contributions) when they were in the classroom environment amongst their peers.

Although in some academic studies these observations and impacts are not always guaranteed and, in some cases, were not reported as a direct consequence of mentoring (Baker, Akiba, Letendre, & Wiseman, 2001), for the case of resit GCSE Maths students from socially and economically deprived areas of Greater London, mentoring did have a great bearing on the effects mentioned above.

An essential learning from the literature which directed parts of this project, was the importance of how high-quality implementation of mentoring can take place. The training package offered to mentors prior to starting the intervention, enabled mentors to discuss and understand barriers to learning and difficulties resit GCSE Maths learners face. In particular, making mentors aware of the environment and approach necessary to be able to support learners in the best way possible – this evidently came through the good relationship and understanding that was reported between mentor and mentee.

Conclusions and Recommendations

- Learners to be targeted/invited but must apply to take part in mentoring (physical/electronic forms) as a way of showing commitment to the mentoring programme. Recommendation would be to particularly focus on returning second year students who proportionally gained the most in attainment and progression in comparison to their peers.
- Mentoring will motivate most students (as per this study) but students within one grade of passing, and don't have the mathematical ability or mind-set to pass on their own should be particularly encouraged to apply for mentoring.
- The adult mentor role should be advertised either internally or externally to a college as an individual outside of the usual GCSE Math department teachers. They should be seen as a supportive member of staff/individual. Ideally, the individual would have

recently left the post-16 sector with at least a Level 3 qualification and a good GCSE Math knowledge. It is preferable that they have some experience of tutoring/mentoring or have been within a supportive role capacity previously.

- A peer mentor (typically an A Level Maths student) should be carefully selected as someone who will be understanding, respectful, supportive, who can step down to the mentee's level without patronising them. This should also be part of their training.
- Mentors to take part in training of Growth Mind-set language and approach, understanding barriers to learning for GCSE Math resit learners, exploring the context of the college and the intake of its learners, different ways of learning and identifying them, access to gap analysis tools/assessments (e.g. Pinpoint learning, internal tracking/assessments of students to date) and GCSE Math resources.
- Give mentors good examples and guidance on giving verbal encouragement and academic feedback appropriately, particularly when mistakes/errors/misconceptions arise (e.g. to not discourage but motivate learners)
- Peer mentors to receive training in how to mentor students in a classroom setting in addition to all the training mentioned above.
- Create a space/room that students can use with their adult mentor each week (where this setting is chosen).
- Sessions to be fluid in structure in the sense that students are allowed to lead on what they would like to focus on as well as some more structured activities/tasks directed by the mentor (e.g. linking topics with gap analysis mentor has done of the students, feedback of topics from main GCSE Math teacher, linking topics to work completed in class as reinforcement, past paper practice).

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Appendices

Appendix A

AIM - Welcome

Academic Improvement Mentor
Training Day
CTM Externment!
20th November 2019

Please complete the following survey using the wifi provided:
<https://www.surveymonkey.co.uk/j/76N8R2H/>

OR code for survey

MathsQuest

2019-2020

1. write down an interest or hobby you do during your spare time (e.g. sports, sewing, clubs, volunteering, music...)

2. write down your dream job/occupation

TEACHERS – this includes you!

MATHS

Your future starts here...

CENTRES FOR EXCELLENCE IN MATHS

AIM - Welcome

Academic Improvement Mentor
Training Day
CTM Externment!
20th November 2019

On the post-it note:

1. write down an interest or hobby you do during your spare time (e.g. sports, sewing, clubs, volunteering, music...)

2. write down your dream job/occupation

TEACHERS – this includes you!

MATHS

Your future starts here...

CENTRES FOR EXCELLENCE IN MATHS

Introduction

The AIM programme (Academic Improvement Mentor) is an Action Research project that you and your college are participating in. It is part of a much bigger national project known as the Centres for Excellence in Maths at 21 different Sixth Forms and Further Education Colleges across the country.

As a mentor, you will be assigned to a GCSE class in order to mentor students who will be re-sitting their GCSE Maths exam. AIM has been designed to focus on improving GCSE Maths student's **motivation**, **engagement**, and **confidence** in the classroom. It will enable you to improve your own communication and interpersonal skills, whilst also giving you the experience and responsibilities as a mentor in the Education system at Post-16; this is definitely one to put down on your UCAS or CV.

CENTRES FOR EXCELLENCE IN MATHS

Introduction

"The advantage in learning from people you know is that they are or have been in a similar position to oneself. They have faced the same challenges as ourselves in the same context, they talk to us in our own language and we can ask them what may appear in other situations to be silly questions"

Rout, D. (2011). Making the move to peer learning.

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Start with WHY

WHY - your purpose
Your motivation? What do you believe?

HOW - your process
Specific actions to realize your Why

WHAT - your result
What do you do? The result of Why. Proof?

<https://www.youtube.com/watch?v=87PecbDQn0w>
Simon Sinek - Golden Circle Start with Why

CENTRES FOR EXCELLENCE IN MATHS

HOW should a mentor act/behave in the classroom? characteristics?

WHY - your purpose
Your motivation? What do you believe?

HOW - your process
Specific actions to realize your Why

WHAT - your result
What do you do? The result of Why. Proof?

Simon Sinek - Golden Circle Start with Why

CENTRES FOR EXCELLENCE IN MATHS

HOW should a mentor act/behave in the classroom? characteristics?

Page 3 - Qualities of a good mentor

- Willingness to share skills, knowledge, and expertise
- Demonstrates a positive attitude and acts as a positive role model
- Takes a personal interest in the mentoring relationship
- Values the opinions and initiatives of others
- Shows enthusiasm

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end with the WHAT...

WHY - your purpose
Your motivation? What do you believe?

HOW - your process
Specific actions to realize your Why

WHAT - your result
What do you do? The result of Why. Proof?

Simon Sinek - Golden Circle Start with Why

CENTRES FOR EXCELLENCE IN MATHS

end with the WHAT...

Page 4 - 7

Remind the mentee that they can do it

Encourage questions

Provide positive feedback

Talk about the exam worries

Talk them through questions

Correct any errors they make

PROFESSIONAL CONDUCT...

CENTRES FOR EXCELLENCE IN MATHS

The projects WHY, HOW, WHAT

WHY - to give students motivation from various view points and people in order to engage and help them with the challenges they face in GCSE Maths

HOW - to use AIM to support students in the classroom

WHAT - evidence of growing confidence and attainment in GCSE Maths

Simon Sinek - Golden Circle Start with Why

CENTRES FOR EXCELLENCE IN MATHS

The Learning Process

CENTRES FOR EXCELLENCE IN MATHS

The Learning Process

Learning styles

Most people have a preferred learning style although often it is a mix of more than one.

When working with your mentee, help them to understand their preferred learning style.

Adapt your approach and presentations to allow for the different preferences.

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Learning style Questionnaire

Honey and Mumford suggest:

- **Activists** - enjoy active learning and trying new things
- **Reflectors** - like to stand back and think before trying something
- **Theorists** - tend to be rational, logical and analytical
- **Pragmatists** - take the common sense approach



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Blocks to Learning

You will be working with some people who may have difficulties with learning even though they have potential. This may seem unusual to you especially if you have always enjoyed and been successful in education.

You can recognise such blocks when people say:

- I can't do this,
- this isn't for me,
- I'm not good enough,
- It's not for people like me

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Blocks to Learning

This may be a result of many issues but it is usually to do with previous failure.

Learners may

- Be disorganised, leading to stress, confusion and failure
- Have behavioural problems
- Lack confidence
- Lack self esteem
- Have had previous negative experiences

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Helping overcome the barriers

If you recognise such 'limiting beliefs' and 'learned helplessness' some good strategies are:

- Listen and help clarify
- Show a genuine interest. Ask for their thoughts and opinions and gradually build confidence
- Use praise where due and help them see the best of themselves
- Encourage them to dream - nothing is as exciting as hearing someone else talk about their life ambitions.
- Have all the information available to answer questions.
- Tell your story - inspire.

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Role Play

- The Mentor
- The Mentee
- The Observer

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Any Questions?

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Appendix B

Centre for Excellence Maths - Mentoring

This questionnaire is to gather data and information on the learners who have participated in Math Mentoring part of the Centre for Excellence Math Action Research Project

* Required

1. Please read the following statements before beginning:

- I understand the purpose of the research project and my involvement in it.
- I understand that I may withdraw from the research project at any stage and that this will not affect my status now or in the future.
- I understand that while information gained during the study may be published, I will not be identified and my personal results will remain confidential.
- I understand that I may contact the researcher or supervisor if I require further information about the research. *

☐ I agree

About you

This section is to gather some information about you

2. What college do you study at? *

- ☐ Christ the King SFC Emmanuel
- ☐ Christ the King SFC St Marys
- ☐ East Surrey College
- ☐ Lewisham College
- ☐ Shooters Hill College
- ☐ St Charles SFC

3. How old are you? * 

- ☐ 16
- ☐ 17
- ☐ 18
- ☐ 19
- ☐ 19 +

4. What is the highest GCSE Maths grade you have obtained? *

- ☐ U
- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4
- ☐ 5
- ☐ 6
- ☐ 7
- ☐ 8
- ☐ 9

5. How many times have you sat an actual GCSE Maths exam? *

- ☐ Never sat a formal exam
- ☐ Once
- ☐ Twice
- ☐ Three times
- ☐ Four or more times

6. What is your main study programme? (e.g. BTEC Business) *

Enter your answer

Mentoring

This section is about your mentoring sessions

7. Have you had any previous experience of mentoring before starting on this programme? *

- ☐ Yes
- ☐ No

8. If yes to the previous question, please could you explain when this was and how it took place?

Enter your answer

9. How many minutes/hours do you spend with your current Math Mentor per week? *

- ☐ Less than 30 mins
- ☐ 45 mins
- ☐ 1 hour
- ☐ 1 hour 15mins
- ☐ 1 hour 30 mins
- ☐ More than 1 hour 30mins

10. What was the main reason why you wanted a Math Mentor? *

Enter your answer

11. Please rank your confidence in GCSE Math before starting mentoring and after mentoring on a scale from 1 to 5 *

	Very low confidence 1	2	3	4	Very high confidence 5
Before starting mentoring my confidence in math...	☐	☐	☐	☐	☐
After starting mentoring my confidence in math...	☐	☐	☐	☐	☐

12. Please rank the following statements using the scale: * 

	Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly Agree
I developed a good relationship with my mentor	☐	☐	☐	☐	☐
My mentor understood my strengths and weaknesses in math	☐	☐	☐	☐	☐
I have spent more time 'doing' math than I usually do because of my mentoring sessions	☐	☐	☐	☐	☐
Through mentoring I am more positive about maths	☐	☐	☐	☐	☐
I feel I have got better at math because of this support	☐	☐	☐	☐	☐
I would recommend mentoring to others resitting GCSE maths	☐	☐	☐	☐	☐

13. What could we change/improve to make the Math Mentoring sessions better? and why? *

Enter your answer

Appendix C

Mentor Interview



CHRIST THE KING
SIXTH FORMS



CENTRES FOR
EXCELLENCE IN MATHS

Centre for Excellence Maths Action Research in partnership with



ST CHARLES
CATHOLIC SIXTH
FORM COLLEGE



SHOOTERS HILL
SIXTH FORM
COLLEGE



EAST
SURREY
COLLEGE
ORBITAL SOUTH COLLEGES

LEWISHAM
COLLEGE

Please indicate site:					
Date:		Face to face:		Interviewer:	

Could you start by telling me briefly about yourself and how you got to this point as Mentor of students taking GCSE Maths?

Could you explain how you are finding being a mentor?

Probe: Has the experience been a positive or negative one?

In a typical session, what do you do when you are mentoring?

How does your mentee respond to your mentoring?

Probe: After helping, could your mentee complete the task?

Probe: What strategies have you used to...engage?

Has your mentoring changed the mentees attitude to Maths?

Probe: How do you know?

Probe: (if attitude improved) What do you think it was that you did to change their attitude?

Probe: (if no change) Why do you think their attitude didn't change (or got worse)?

Is there anything that could be done to improve the experience next time?

Appendix D

Mentee Interview



CHRIST THE KING
SIXTH FORMS



CENTRES FOR
EXCELLENCE IN MATHS

Centre for Excellence Maths Action Research in partnership with



ST CHARLES
CATHOLIC SIXTH
FORM COLLEGE



SHOOTERS HILL
SIXTH FORM
COLLEGE



EAST
SURREY
COLLEGE

LEWISHAM
COLLEGE

Please indicate site:					
Date:		Face to face:		Interviewer:	

Could you start by telling me briefly about yourself and your previous math experience before being mentored?

What do you do during sessions with your Mentor?

Probe: In what other ways has your Mentor helped you (other than math)?

How have you found working with your Mentor?

Probe: Has the experience been a positive or negative one?

How have you responded to your mentor?

Probe: Are you able to complete tasks after they have helped you?

Did this experience change your attitude towards Maths?

Probe: How do you know?

Probe: (if attitude improved) What do you think it was that they did to change your attitude

Is there anything that could be done to improve the experience next time?

Appendix E

Mentoring observation sheet/activity log (first 16 mins)



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CENTRES FOR
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Centre for Excellence Maths Action Research in partnership with

CTK	
SHC	
St Char	
NHN	
Date:	



ST CHARLES
CATHOLIC SIXTH
FORM COLLEGE



SHOOTERS HILL
SIXTH FORM
COLLEGE



Mentor/Mentee Classroom Behaviour Observation Scale

Set a stopwatch/timer to repeat every 2 minutes for 16 minutes. When two minutes are up, classify the Mentors/mentees behaviour in the following categories. Note: 1 is the first 2 minutes, 2 is the second 2 minutes, etc.

May

MENTOR	Interaction Behaviour	1	2	3	4	5	6	7	8	Total
1	Explaining									
	Modelling									
	Asking questions									
	Answering questions									
	Giving verbal feedback									
	Verbal encouragement									
	Doing nothing									
MENTEE										
1	Listening to Mentor									
	Asking mentor question									
	Producing written work									
	Disengaged									

Appendix F

Confidence levels

Confidence with Maths when answering questions:

Level 1: Student gives up without even reading questions

Level 2: Student reads questions, answers them if they are one step, but leaves them out completely if more complicated

Level 3: Student reads questions, answers the simple part but leaves rest out

Level 4: Students reads questions, does all he/she can, and seeks help on the rest

Level 5: Student reads questions, does all he can and asks specific questions about the rest with the mind-set of finishing them himself/herself