



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

The ~~is action research projects~~ purpose and intention [of this action research project](#) 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 outside of the classroom might enable learners to build on their confidence in maths, their academic self-concept and attainment. Six post-16 institutions were involved across Greater London, with seven maths specialist mentors taking up the supportive role. These mentors targeted and supported 150 students across the entire intervention. A series of questionnaires completed by mentors and mentees as well as one to one interviews with them ~~contributed~~[gave](#) qualitative data towards the findings. Alongside this, 16-minute schedule lesson observations were used to formalise what actually happened and occurred during the session. Attendance and performance sheets were used to track learners participating in the programme.

This study revealed that by offering one-to-one or small group mentoring outside of the classroom (with the emphasis of growth mind-set language and support), the self-confidence of learners resitting the GCSE Math 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 significantly better than those not being mentored.

Contents

Background	5
Literature Review	6
Definition of Tutoring Vs Mentoring	6
The Origin of Mentoring	8
Increasing demand on Tutoring	8
UK Government Policy – Covid-19 response	9
High quality Implementation	10
- Training for tutors	10
- Frequency and length	10
Impact of Mentoring/Tutoring	11
Methods	12
Mentors	12
Participants	12
Procedure	12
Findings	14
Key Principle 2	14
Key Principle 3	17
Key Principle 4	18
Conclusions and Recommendations	21
Conclusions	21
Recommendations	22
References	23
Appendices	25
Appendix A	25
Appendix B	27
Appendix C	29
Appendix D	30

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. In 2015 the UK government applied the condition of funding for Further Education (FE) colleges, 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, less than 1 in 5 students achieve grade 4, 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 students each year has meant motivation and engagement are key factors in helping to embed a growth mind-set, overcome anxieties and develop resilience. 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. 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.

Definition of: Tutoring Vs Mentoring

Bray and Kwok (2003) define private supplementary tutoring as “~~means~~ tutoring in academic subjects which is provided by the tutors for financial gain and which is additional to the provision by mainstream schooling”. However, their study focused on tutoring in Hong Kong, which tends to take place mostly in evenings, weekends and vacation times.

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 this particular CfEM action research, a combination of elements from both the Tutoring and Mentoring categories are being used. This enables different centres to optimise opportunities for their students. For example:

- the individual supporting students will be recruited to have the subject knowledge in Mathematics to support students with their studies by going through exam papers and questions (Tutoring) but also trained to support life skills such as time management, confidence building, well-being and overcoming math/exam anxiety (Mentoring)
- the sessions will take place outside of the classroom (Mentoring)
- 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)

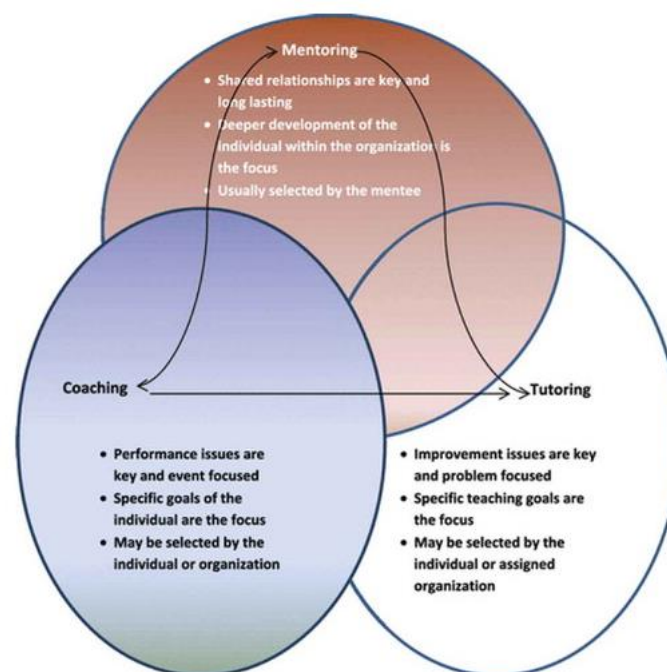


Figure 1. (Irby, Editor's overview: Mentoring, tutoring, and coaching, 2012, p. 297)

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.

The Origin of Mentoring

The term and action of mentoring dates back to at least 3000 years to the Ancient Greek myth of Homer’s Odyssey (Olson, 1995). Odysseus was a leader in the Trojan War and had to be away in the siege of Troy. Odysseus had to entrust a family friend, Mentor, with the care of his son Telemachus. Mentor’s responsibility was to act as a parental substitute, role model, teacher, advisor and counsellor providing guidance and support to the inexperienced son of Odyssey, Telemachus. The story models the mentoring relationship as a more experienced person developing and supporting a less able and inexperienced person. Such definitions and models of mentoring, as seen in Homer’s Odyssey poem, are still being used in literature to this day (Sharp, Nikolaos, & Abrahams, 2016). This form of mentoring (a more experienced person developing less able person) is itself representative and relevant to this action research project.

Increasing demand on Tutoring

Private or individualised tutoring is generally thought to provide an ideal environment where students can receive tailored help and support [for](#) their needs. To date, literature seems to be indecisive about the effects and impact of private tutoring on students’ academic performance. One thing for certain is that private tutoring takes many forms across the world in different countries and includes additional teachings in large classes. Whilst in some societies it is a major industry, providing income for the tutor and on the other hand absorbing much of household expenditure, it appears to also exacerbate social inequalities (Tansel & Bircan, 2006), (Bray & Kwok, 2003). Bray & Kwok (2003) refer to this growing industry as a *“shadowy phenomenon which is difficult to document”*. The ‘shadow education’ relates to how tutoring normally follows or extends the normal school curriculum (Ireson, 2004). Both studies demonstrate how perhaps free access to tutoring or mentoring within an institution may counteract the social inequalities and strain put on household income to offer such a service of support for students. This is particularly true for the institutions involved in this action research where many students are from disadvantaged backgrounds and live in socially deprived areas – where private tutoring would not be a possibility for a low-income family.

In the UK, tutoring has long since been a valuable employment for university students or teachers seeking additional financial support. Whilst most are delivered in the private sector, there are also some public sector involvement through extracurricular activities, for example as maths club or GCSE revision catch up classes. These activities are included in the government definition of ‘Study Support’ (UK Department for Education and Employment , 1997) and more recently in the 16 – 19 Catch up Fund (Government DfE Guidance, 2020):

'learning activity outside normal lessons which young people take part in voluntarily . . . Its purpose is to improve young people's motivation, build their self-esteem and help them to become more effective learners. Above all it aims to raise achievement' (DfEE, 1997, p. 1).

Damayanthi (2018) studied the effects of private tutoring in Sri Lanka and raises two reason for an increasing demand in private tutoring; *"to raise further the existing level by maintaining their competitive advantage at school and as a supplement that fill the deficiencies of mainstream curricula"*. This links back to the UK governments own strategy to fill the deficiencies of learning and qualification with resit GCSE Math and English learners.

The motivation for having a mentor/tutor for students is listed by Ireson & Rushford (2002) who compiled students' answers to open ended questionnaires during the pilot phase of their research [Table 2]. Most students (71%) indicated that they had tutors to help them do well in examinations and test [Table 2]. The second most common reason for having a tutor (40%) was to help students learn subjects more quickly.

Students' reasons for having extra tuition	Y6	Y11	Y13	Total	χ^2
To do well in an entry exam into secondary school/high grades in exams	68	77	71	71	4.8***
To help me learn subjects quicker	50	44	27	40	37.5***
Because I need extra help with my work	36	31	32	33	1.8
To help me catch up on work missed	25	17	11	17	20.0***
Because I do not learn well from my teachers at school	7	17	27	17	46.0***
Because my school does not provide enough help	7	19	15	13	15.6***
The school recommended I got extra help	16	8	8	11	9.9**
Because I have additional learning needs	11	10	7	9	4.2
Total with tutor in year	297	204	326	827	

** p<.01 ***p<.001

Table 2: (Ireson & Rushford, Private tutoring at transition points in the English education system: its nature, extent and purpose., 2004, p. 20)

UK Government Policy – Covid-19 response

A more recent demand on tutoring has occurred in the since the outbreak of Covid-19 pandemic. The UK government has recognised that *"children and young people across the country have experienced unprecedented disruption to their education as a result of coronavirus"*. Similar to Christ the King Sixth Form College and their network partners, many resit GCSE Math learners are from *"the most vulnerable and disadvantaged backgrounds"* who *"will be among those hardest hit"* by the global pandemic (Government DfE Guidance, 2020). A £96 million one-off funding, **16-19 catch up fund**, has been introduced by the government for the academic year 2020-2021 only. The government have a ring-fenced this budget around those learners without a grade 4 or 5 in GCSE English and Maths:

“The funding is being provided to support small group tuition for 16 to 19 students in English, Maths, and other courses where learning has been disrupted. For example, vocational courses where assessment has been deferred because of lockdown. Although the actual tuition does not need to be for GCSE English or Maths, the students supported all need to be those who had not achieved grade 5 or above in at least one of those subjects at this level by age 16. All supported students must be on a 16 to 19 study programme.”

This again highlights the importance and recognition from the UK government that extra tutoring can make a difference in bridging the gap for resit GCSE learners.

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).

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) found children who attended such programs spent more time on academic and extracurricular activities than children who did not.

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).

Methods

Mentors

The approach to recruiting the mentors differed across the five sites involved in this action research. Four of the seven mentors were returning mentors from the same project the previous academic year. They were recruited through an application and interview process. These mentors were undergraduate maths students from a local university which Christ the King Sixth Form College had built a collaborative relationship with through the CfEM programme. Advertising took place online and through word of mouth with the senior Math lecturer and coordinator at this university. One of the mentors was an undergraduate in a different field from maths but who had a strong mathematical background with tutoring experience. However due to factors relating to covid, this mentor did not start until the second cycle of intervention (March 2021). The final two mentors were part-time members of staff already employed by the college in which they worked, but who were interested in taking up the role within their setting; again, these individuals had a strong mathematical background.

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 was created and delivered through the Centre Lead 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. Due to Covid restrictions, the majority of this training took place remotely.

Participants

Students participating in the mentoring programme were selected based on their entry grade as well as internal diagnostic assessments. The approach was to target the intervention towards students who were currently on a grade 3 but who would volunteer and apply onto the programme, showing commitment (before the November GCSE series). For the first cycle of intervention there were approximately 40 students participating in mentoring. The second cohort of students were targeted after the January 2021 results using the data from their external examinations. The intervention would not be exclusive to a select few who met these criteria but also open to those who showed interest in getting extra support and guidance outside of the classroom. In the second cycle of intervention, approximately 65 students were participating in mentoring.

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, during the later stages of the mentoring programme, to complete an online survey (Appendix B). 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 informed us of any improvements that could have been made to the mentoring programme as it continued throughout the academic year and gave us a background/overview of the participants involved.

Recorded and transcribed interviews were used with both the mentor and the participants (Appendix C & D). 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, two 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.

At the end of the programme, an attendance monitoring report for participants were collected from each site to observe attendance levels across the mentoring programme and also their GCSE Math lessons on site.

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 attendance.
4. To evaluate the progress of by learner characteristics (race, SEN, previous attainment, etc.) being mentored through classroom assessments and external exams.
5. To share results and, if possible, effective approaches, with GCSE maths re-sit teachers locally and nationally.

Findings

To analyse our findings, we will first look back at each of Action Research objectives and discuss the data and evidence collected and if they provide any insight towards this key principle. This section will also seek to link any suggestions from the Literature Review that support these findings or whether the findings suggest something different.

Key Principle 2

To investigate which aspects of the mentoring programme, have the greatest positive impact on students' attitudes, and why?

The designed mentoring programme which took place outside of the classroom and in small groups (no larger than 5 students per session) had quite evidently, through the mentor interviews conducted, created a *“safe environment where [students] feel comfortable to ask questions, be fully heard and helped without being judged”*.

This nurturing approach had been emphasised during the training package all mentors had received prior to mentoring (Appendix A). Consequently, the general consensus from the mentee interviews, were that students felt more confident about their mathematical ability after each session and they felt *“empowered”* to speak out more in their normal GCSE Maths lessons:

“In my normal Maths lessons, I find myself speaking more confidently.”

Example of mentee response from interviews conducted (Appendix D Q5)

Mischo & Haag (2002) discussed how tutoring raised student academic self-concept which had also manifested in our findings. It is important to note that sometimes these findings are not always guaranteed (Baker, Akiba, Letendre, & Wiseman, 2001).

Ultimately, a shift was seen in their attitude towards maths where many students had clearly stated several times that they even *“started to enjoy Maths”* – a statement they themselves were shocked in making. This would seem to concur with the findings from MacBeath, Kirwan, & Myers (2001) whereby the greatest impact from study support sessions were seen on students self-esteem and willingness to participate in class for those in their final examination year (in their case Year 11). This positive environment was important for students' improved attendance at the mentoring sessions.

Mentors reported that in order to cultivate this atmosphere, it was essential that students were given *“more space to make errors”* but that these errors/misconceptions could be identified and resolved carefully through slow unpacking and discussions – the idea of filling in gaps in the main-stream curricula (Damayanthi 2018). In order to facilitate this, both the mentors and mentees agreed that a typical session would focus on key topics that either the learner themselves selected or the mentor identified through analysis of the learners' work.

~~Despite what~~ Regardless of the 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 six sixteen-minute observations conducted, 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.

The observations 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 resit 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).

MENTOR	Interaction Behaviour	Obs 1	Obs 2	Obs 3	Obs 4	Obs 5	Obs 6	Total
	Explaining	2	2	2	2	3	2	8
	Modelling	2	3	2	0	0	0	7
	Asking questions	1	1	1	2	2	1	5
	Answering questions	2	2	2	0	0	2	6
	Giving verbal feedback	1	2	0	2	2	3	5
	Verbal encouragement	1	2	1	2	2	0	6
	Doing nothing	0	0	0	0	0	0	0
MENTEE								
	Listening to Mentor	4	2	3	2	3	2	14
	Asking mentor question	3	2	2	0	1	2	8
	Producing written work	4	4	3	6	4	4	21
	Disengaged	0	0	0	0	0	0	0

Results from six sixteen-minute observations of mentoring session

Analysis of the post-mentoring questionnaire completed by thirty learners participating in the programme revealed and supported the findings found through the observations. 76.6% of responses (23 of the 30 students) strongly agreed/agreed that they spent more time 'doing maths' than they usually do as a direct consequence of being involved in the mentoring programme (Image A). Similarly, 73.4% of learners strongly agreed/agreed that through mentoring they felt more positive about maths (22 of the 30) with even more (86.6%) strongly agreeing/agreeing that they felt they had got better at maths because of this support. This suggests most mentees were, building their academic self-concept (Mischo & Haag 2002).

Again the developing relationship between mentor and mentee showed positive results whereby 83.3% of the learners strongly agreed/agreed that they had developed a good relationship with their mentor (25 of the 30). This could suggest how the shared relationship between the mentor and mentee were key and long lasting (Irby, 2012).

Importantly, 86.6% of the returned responses would recommend mentoring to others resitting their GCSE Maths, with over half of the total number of responses strongly agreeing with this statement.

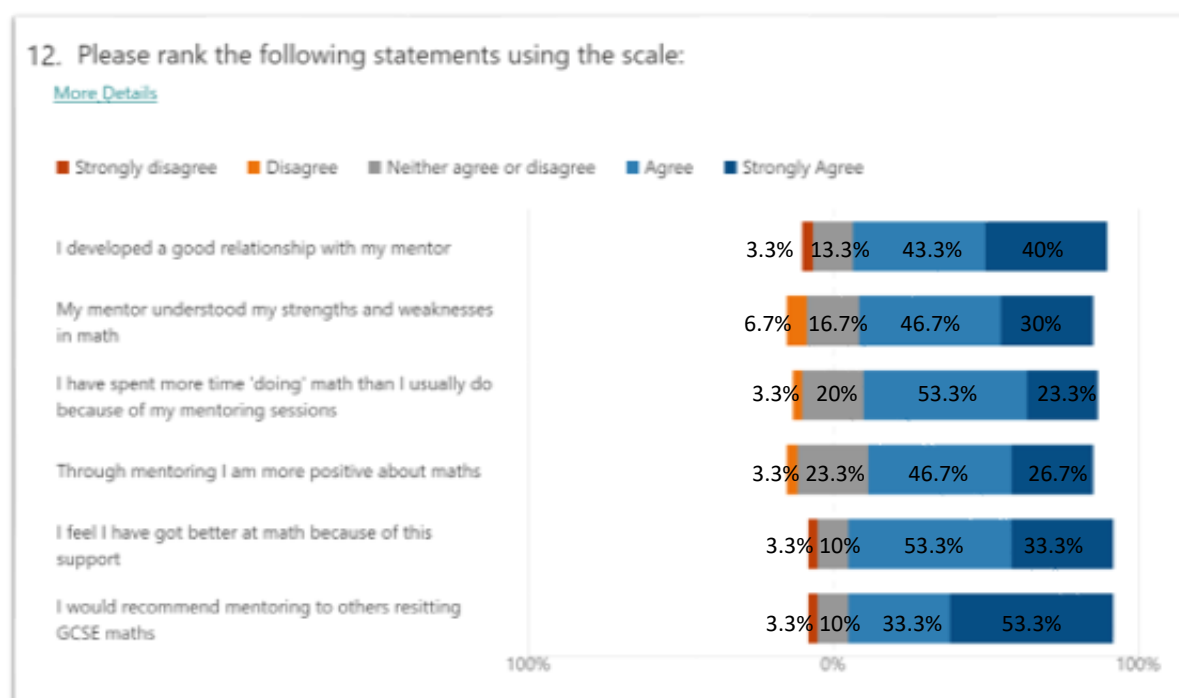


Image A: Summary of data collected from post survey questionnaire for mentees (Appendix B)

Further analysis of the post-mentoring questionnaire (Appendix B) revealed that the most common reason for students wanting to have a mentor for GCSE Math was that they believed it would improve their Maths grade and help them get a grade 4 (some students gave more than one reason and these were treated as distinct responses).

Students' reasons for having extra tuition	Y6	Y11	Y13	Total	χ^2
To do well in an entry exam into secondary school/high grades in exams	68	77	71	71	4.8***
To help me learn subjects quicker	50	44	27	40	37.5***
Because I need extra help with my work	36	31	32	33	1.8
To help me catch up on work missed	25	17	11	17	20.0***
Because I do not learn well from my teachers at school	7	17	27	17	46.0***
Because my school does not provide enough help	7	19	15	13	15.6***
The school recommended I got extra help	16	8	8	11	9.9**
Because I have additional learning needs	11	10	7	9	4.2
Total with tutor in year	297	204	326	827	

** p<.01 ***p<.001

Summary of findings	Frequency
To build confidence in maths	2
To improve in maths/better understanding	10
To pass/improve grade in the GCSE Math qualification	17
To help me understand and improve on my gaps in knowledge/areas of weakness	2
Get extra help	2

Summary of findings from Q10 post questionnaire Appendix B

Table 2: (Ireson & Rushford, Private tutoring at transition points in the English education system: its nature, extent and purpose., 2004, p. 20)

This was also the case found by Ireson & Rushford (2002). It may be argued that students feel the need (overriding the feeling of wanting) to gain the qualification to be able to proceed with their future academic or career plans as found with the student responses in Ireson & Rushford's study – entry exams into secondary school. It would seem the Government's decision to insist students resit the GCSE Math qualification until a Grade 4 is

accomplished has somewhat impacted on the students' perception of the relevance of the qualification.

[Despite](#)[In addition to](#) learners confirming verbally through the interview process that they felt more confident in GCSE Math because of mentoring, they were also asked to rank their confidence level before and after mentoring during the questionnaire phase of data collection.

Image B shows the results of participants self ranking of confidence on a scale from 1 to 5 (1 being very low confidence and 5 very high confidence). All students apart from one had reported an increase in confidence of one or more scale points, with the one response reporting the same confidence level (3) each time. Of the 30 responses, 13 students said they had very low or little confidence in GCSE math prior to mentoring, reducing to 2 students after mentoring took place. Conversely, no one has reported high confidence in GCSE Math prior to mentoring in comparison to 8 students after mentoring.

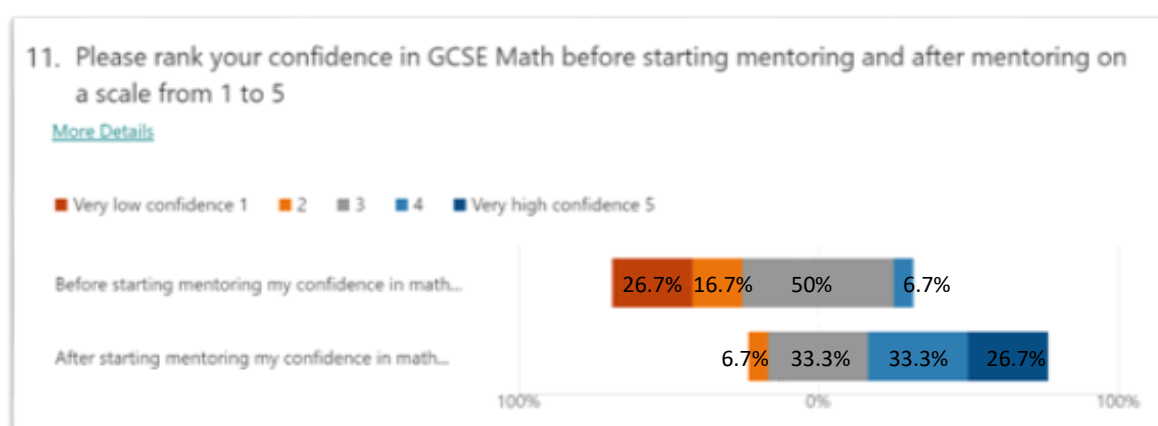


Image B: Summary of data collected from post survey questionnaire for mentees (**Appendix B**)

Key Principle 3

To analyse whether the mentoring programme has an impact on student attendance.

The attendance to mentoring session was monitored throughout the entire programme at each participating college. At each site the beginning and end of the mentoring programme differed but a 13-week window where attendance was tracked at the same time across all institutes was used to inform the following findings.

REMOTE PERIOD					FACE TO FACE							
Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12	Week 13
Remote Sessions					Face to Face							
Present		275			85%		Present		379		73%	
Absent		24			7%		Absent		120		23%	

Blank	26	8%	Blank	21	4%
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Summary of attendance of 13-week period of mentoring

During the 13-week window, periods of mentoring were forced to take place remotely (due to the second Covid-19 National lockdown) and then face to face when colleges reopened.

There is evidence to suggest a difference between attendance to the sessions when the mentoring was delivered remotely in comparison to face to face. Attendance dropped by 12% when the mentoring sessions started to take place face to face. There could be a number of reasons for this such as the convenience factor of attending session remotely from home in comparison to arriving at a particular time and place at college, self-isolation requirements when learners were back on site and the possible impact of the Government's announcement of cancellation of exams around the time colleges re-opened and the impact the lockdown had to the mental well-being of learners. Despite these important factors, when compared to the attendance of whole cohorts of GCSE Maths learners, the attendance to remote sessions of mentored students was considerably higher (almost double in some cases) than their peers. Learners being mentored did suggest during the interviews that they preferred face to face mentoring over remote when they were asked what improvements could be made to the programme. This however does not provide any real information about the quality of the intervention received by learners – some learners suggested that they focused and concentrated better during face-to-face sessions.

Unfortunately, the data collected by the action research group suggested inconclusive findings due to the nature of the unprecedented impact covid-19 and lockdowns had on student's attendance overall both to college and to remotely.

Key Principle 4

To evaluate the progress of ~~by learner characteristics (race, SEN, previous attainment, etc.)~~ being mentored through classroom assessments and external exams, split by characteristics such as race, SEN and previous attainment.

To gain a better understanding of the learner profile and characteristics of participants, it was important to first gain an understanding into their prior experience with tutoring/mentoring. It became apparent that only 13% of those surveyed (4 out of 30) had any previous exposure to tutoring or mentoring. Of the four who did say they had received some form of tutoring, it could be interpreted that two were offered this provision by their secondary schools and two were funded privately:

- *"I had a math's tutor in year 10. But I simply stopped attending, I found it fine but because my mindset wasn't focused on education I took my focus elsewhere, which I do regret."*
- *"Private tutoring"*
- *"Secondary school"*
- *"When I was in secondary and it was in a centre"*

This was a finding the action research group had anticipated due to the nature of our college intake being predominantly disadvantaged, free school meals students who live in socially deprived communities and from low-income households – a focus shared through the

introduction of 'Study Support' and the '16-19 Catch up funding' by the Government to narrow the gap of learning lost ~~by~~ the most disadvantaged learners. The statistics also seem to echo the findings from Ireson's (2004) study of 3000 students, where those eligible for free school meals, only 19% were involved in tutoring/mentoring.

Having revealed crucial evidence that students were improving in their academic self-concept (Key Principle 2) in GCSE Maths it had been suggested, through the literature, that this in turn is beneficial to student achievement (Mischo & Haag 2002). However, it was also argued that effects on attainment are inconsistent within well-controlled experimental studies (Baker, Akiba, Letendre, & Wiseman, 2001).

For the purpose of this research, progress and attainment was monitored through the ~~students~~ students' grades on entry to college (for first year students this would have been a Centre Assessed Grade from their secondary school in 2020) to their Summer 2021 Teacher Assessment Grade (TAG) which was based on high control assessment data taken between March and April 2021.

Number of years on the GCSE Maths course	Total	%	Number gaining grade 4	%	Number making progress during mentoring period	%
First	21 (22)	40%	12 (+ 0)	57.1% (57.1%)	14 (+1)	66.7% (68.2%)
Second	14 (17)	26%	11 (+ 2)	78.6% (76.5%)	11 (+2)	78.6% (76.5%)
Third	11 (14)	21%	2 (+ 1)	18.2% (21.4%)	3 (+1)	27.3% (28.6%)
First & SEND Status	1	2%	0	0%	1	100%
Second & SEND Status	3	6%	2	66.7%	2	66.7%
Third & SEND Status	3	6%	1	33.3%	1	33.3%
SEND Status - Overall	7	13%	3	42.9%	4	57.1%
Rest - Overall	46	87%	25	54.3%	28	60.9%
All	53		28	52.8%	32	60.4%

Summary of attainment and progress for GCSE Math resit learners who were mentored by year group and SEND status

Overall, of the 53-mentee data collected, 28 students (52.8%) attained a grade 4 in Summer 2021 (TAGs). This is significantly higher than each colleges' overall pass rate for the year ~~that were part~~ of this project. The largest proportion gaining a grade in GCSE Maths were the second year learners (76.5%), who statistically have been the largest proportion year group gaining the qualification during the resit programme from our whole cohort college data analysis.

Students identified with a SEND status did comparatively better on attainment (42.9%), proportionally speaking, than their third year peers (18.2%) but fell marginally behind the rest at 54.3%. The same is also true when taking progress into consideration, 57.1% of SEND learners made progress, which was more than double of the third year students (proportionally), but slightly behind the rest at 60.9%.

Further analysis showed that of the mentored students whose data was collected (53 data points collected) on average a 1.0566 grade increase was seen from Entry Grade to Summer 21. To put this into context a full cohort of resit GCSE Maths at one site of Christ the King Sixth Form Colleges stood at 0.743 (it is also important to note here that this site also formed the largest number of students being mentored who took part in this project and the largest data set collected from the 53 individuals in the analysis above).

Ethnicity	Total	%	Number gaining grade 4	%	Number making progress during mentoring period	%
African	24	45%	14	58.3%	16	66.7%
Caribbean	4	8%	1	25%	1	25%
Any other Black / African / Caribbean background	10	19%	4	40%	6	60%
White and Black African	1	2%	1	100%	1	100%
White and Black Caribbean	2	4%	0	0%	0	0%
English / Welsh / Scottish / Northern Irish / British	3	6%	2	66.7%	2	66.7%
Any Other White background	4	8%	2	50%	2	50%
Arab	2	4%	1	50%	1	50%
Asian	1	2%	1	100%	1	100%
Any other ethnic group	2	4%	2	100%	2	100%

Summary of attainment and progress for GCSE Math resit learners who were mentored by ethnicity

The table above shows, of the data collected (53), the distribution of those mentored by their identified ethnicities. The largest proportion of students being mentored through this programme identified as African ~~and/or~~ Any other Black/African/Caribbean background. Of these two largest groups (34), 18 gained a grade 4 by the end of the intervention (52.9%) and 22 made progress during the mentoring period (64.7%).

It is important to highlight here that due to the minimal numbers across the other ethnic groups collected for this study, any analysis would not be conclusive or reliable to use as comparisons.

Conclusions and Recommendations

Conclusions

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 outside of the classroom environment (whether that was additional or replacing their timetabled lesson); caused a significant shift in their self-declared confidence before and after mentoring ([echoing findings by](#) Mischo & Haag 2002). This in turn changed some of their behaviours (contributions) when they were back 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 approaches 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.

Positive gains in student attainment and progress data, in our view, came because of academic self-concept, building of confidence, changes in behaviours and attitudes (although it is important to bear in mind the way in which the Summer 21 grades were generated internally through assessment data as appose to external exams in a generic resit GCSE year). It may be argued that it was not what activities or tasks that took place in those sessions that generated these findings but the emphasis of creating a safe and trusting learning environment that enabled students the freedom and space to make mistakes, express their views and discuss, that counted. That being said, students and mentors did both suggest that identifying gaps in knowledge and having shared responsibilities of who lead in those sessions (e.g. mentee identifying particular topics or the mentor providing a schedule of target topics) was a frequent occurrence that students found helpful.

Recommendations

- The mentor role should be advertised either internally or externally to a college to recruit as an individuals outside of the usual GCSE Math department teachers. They should be seen as a supportive member of staff/individual. Ideally, the individuals 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.
- Mentors should~~te~~ take part in training in~~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.
- Create a space/room that students can use with their mentor each week.
- Sessions should~~te~~ be of lengths between 45 minutes – 90 minutes, taking place outside of the classroom in one to one or in a small group no larger than 5. The sessions to be timetabled during non-timetabled lessons for the learners or in replacement of their usual GCSE Math lesson (former is preferable so that it is additional support and in class T&L is not lost)
- 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.
- Sessions should~~te~~ 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).
- 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).

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Appendix A

25

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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13

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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14

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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15

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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16

Role Play

- The Mentor
- The Mentee
- The Observer

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17

Any Questions?

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18

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



Centre for Excellence Maths Action Research in partnership with



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



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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 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?

--