CENTRES FOR EXCELLENCE IN MATHS

Fareham College

Can a coaching approach improve achievement and progression for students resitting GCSE Maths?

Rosie Sharp

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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.

Abstract

This action research explored the impact of additional coaching for Further Education (FE) students who felt they suffered with maths anxiety, specifically their progression and confidence in their mathematical ability. The coaching focused on not only developing academic skills but supporting students to adopt a growth mindset. With over half the working age population having the numeracy level expected of a primary school child and the well documented fact that poor numeracy skills limit opportunity later in life the topic seemed not only prudent to explore but imperative if we want to improve maths achievement for our students.

Developing a keen understanding of changes that we could apply to our delivery models to improve confidence and understanding for our students seemed an important and feasible step, given the limited funds available in further education.

A case study approach was identified as being appropriate for this project across 6 further education establishments. A review of literature was completed to establish context and previous study undertaken. Questionnaires were conducted with students participating in the coaching and interviews were then undertaken with staff at the colleges contributing to this study, in order to identify personal perspectives of the impact of coaching in the individual establishments.

Evaluation of the data has demonstrated that the implementation of a coaching model that develops not only academic skills but additionally supports the development of a growth mindset does indeed impact positively on student's mathematical confidence and ability to independently problem solve.

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Introduction

This is an investigation into whether models of coaching can improve students' achievement and progression in GCSE Maths by reducing maths anxiety and developing a growth mindset.

The majority of our students come to us having failed the maths GCSE (level 2) at school, lacking in confidence about their ability to understand the curriculum and in some cases having built up barriers to engaging with maths delivery which makes progression impossible for them. The national Condition of Funding requires them to keep studying until age 19 towards their GCSE if they have a grade 3. Many are resigned to continually keep failing this exam until they can opt out at 19, which limits their options to progress to study at level 3. We have learnt from our work on maths anxiety last year that individual support to plug gaps and build confidence can change this mindset. Additionally, the Solent LEP reports that the area in which the Colleges are located has a negative gap in advanced skills with the national average. In essence, the Solent needs more residents that hold degrees or other equivalent advanced qualifications. Supporting students to achieve their maths GCSE will open doors for higher levels of study and ultimately better paid employment.

In light of the current situation of Covid-19 impacting all communities we are expecting unemployment to rise and an influx in students that choose to access FE as opposed to an apprenticeship. Additionally, many students will not achieve their grade 4 this academic year through the centre assessed grading system and will be required to continue to study in 21/22 even if this is not their first preference. Many of these students would have had limited engagement with online learning between March 2019 and their final assessment in May 2020 and will require additional support to catch them up and re-engage them in study again. The coaching models proposed will have a vital role in supporting students to have a better mindset and approach to learning and making progress in maths.

The Quality Improvement Plan for the maths department at Fareham College has a focus on improving attendance and participation to maths classes and in the wake of the recent lockdown we are keen to adapt our delivery to include some synchronous and asynchronous learning opportunities which will complement our coaching models so that we can ensure students have no gaps in learning and continue to get the extra support provided by coaches in the event of a further lockdown. Retention of these students across the year will be vital therefore it is imperative that we have an engaging and motivating suite of learning opportunities that students want to access to ensure they can make tangible progress.

This project will be aimed at post 16 students that are retaking their maths GCSE alongside a vocational course. Students may have a starting grade of 2 or 3. These students would have been identified as having significant gaps in maths knowledge and anxiety around the improvement of these skills.

We hope that by working with these students on a one-to-one basis for a period of time we can improve their mindset around the study of maths and extend this to learning in the broader sense. We will help students improve their understanding of mathematical language and functions. Ultimately, we are keen to demonstrate that this approach can improve students well-being and help them to achieve one grade progress over the course of an academic year in their mathematics qualifications as well as making significant progress towards their desired progression route of higher education or apprenticeship.

Key objectives:

1.To identify the factors and variables that contribute to maths anxiety.

2.To explore methods to appropriately and accurately capture students' attitudes and perceptions over a period of time in regard to motivation and engagement, maths anxiety and growth mindset.

3. Design and develop an online coaching model that incorporates elements of blended learning.

4. Design and develop a coaching structure that supports students in a 1:1 or small group within a dedicated learning hub.

5. Analyse student data to ascertain the most effective and successful of the 2 coaching models.

6. Design and implement an effective, thorough and sustainable coaching model that develops growth mindset by addressing maths knowledge gaps and low confidence with an additional focus on the development of students understanding of mathematical language.

7. Analyse the effects of coaching intervention models and the impact they have on teachers and students across a minimum of 6 settings.

8. To measure the impact of maths coaching intervention on the achievement of one grade progress in the Action Research Cycle.

9. Analyse the attendance and participation within timetabled maths classes of students that have additional coaching.

10. Identify the skills and knowledge required to deliver coaching successfully in a FE setting.

11. Explain and share findings and recommendations regarding maths coach intervention for GCSE re-sit students across the 12 FE establishments within the Network Partnership.

12. Assess the sustainability of the 2 coaching models in a FE setting for future delivery.

13. Investigate the required aspects of successful leadership to enable a working coaching model in an FE setting.

Literature Review

The achievement of maths in the Solent region is lagging behind the rest of the UK, in fact the Solent Local Enterprise Partnership (SLEP) reports that the area has a negative gap in advanced skills with the national average (Solent Local Enterprise Panel, 2020). In essence, the Solent needs more residents that hold degrees or other equivalent advanced qualifications.

The most recent report from the Association of Colleges detailing the grade profiles and progression data for maths and English qualifications show that only 53% of students entering further education (FE) hold a high pass in their maths GCSE (Association of Colleges, 2020). Many students entering FE are lacking in confidence about their ability to understand the curriculum and in some cases have built up barriers to engaging with maths delivery which makes progression impossible for them. Many are resigned to continually keep failing this exam until they can opt out at 19 which limits their options to progress to study at level 3 and the type of employment in which they can engage in latter years.

In an attempt to improve the delivery of STEM subjects across the United Kingdom in 2019 the Department of Education pledged £7.3 million in funding for professional development of teachers of STEM subjects. The project suggests that the ability to robustly teach these subjects translates into improved achievement for young people. Additionally, it is hoped that this investment would also go some way in attracting new teachers to pick up the mantle and enter the world of teaching STEM or indeed to retain existing teachers in the subject area. The Times Education Supplement reports that two thirds of secondary schools struggle to fill maths teaching vacancies (Woolcock 2018). One could argue that with a lack of quality STEM teachers and new teachers willing to take on the subjects coupled with poor achievement of STEM subjects from students we appear to be caught in a cyclic cause and effect story.

One suggested contributing factor to the poor achievement of maths is maths anxiety (Skagerlund, Ostergren, Vastfjall & Traff, 2019). Maths anxiety is described as a debilitating emotional reaction to mathematics by Szucs & McLellan (2019) although according to research undertaken by the Centre for Neuroscience in Education at the University of Cambridge three quarters (77%) of children with high maths anxiety are normal to high achievers within the maths curriculum. Could one determine from this that anxiety is purely test related? Should educators be exploring other ways to teach and assess students in STEM subjects?

Andrews and Brown (2015) examined maths anxiety with college students and made links between students' earlier negative schooling experiences and feelings of inadequacy about maths and the ensuing standardised testing. It highlighted that these earlier experiences enabled an avoidance of STEM related subjects in later education which was impacting on a greater scale the ability to earn 'middle class wages', as similarly highlighted in the earlier mentioned SLEP report for the Solent region. They go on to recommend that educators can learn lessons from the relationship between maths anxiety and standardised testing to better prepare students and stage interventions that encourage dealing with maths challenges head on and move forward rather than developing a tradition of avoidance. One could argue that honing this approach to difficulties would also benefit students in the wider sense.

Henschel & Roick (2020) like Andrews and Brown (2015) utilised the Maths Anxiety Rating Scale (MARS) to rate anxiety and nervousness. One may question though the universal

agreement of what constitutes anxiety. The degree that one feels anxious and or nervous is surely subjective?

However, all do agree that nervousness and anxiety is particularly pronounced in testing scenarios that are evaluated by teachers as opposed to dealing with everyday maths where for example one may need to work out the percentage of a discount in a shop. This lends weight to the argument that environmental factors are extremely important in the development of maths skills. For instance, if one chooses to believe this theory, a classroom setting is much more likely to induce fear than an informal coaching session. Given the recommendations from Andrews and Brown (2015) where the need is to face problems head on to be able to move forward, the informal coaching approach lends itself to further investigation.

For the purpose of this literature review I will focus on two papers that both offer a view on maths anxiety and its impact on a student's achievement and wellbeing, relationships between anxiety and high stakes scenarios such as examinations as well as classroom based instruction. These two papers were carefully selected as being relevant, robust and formative for our own study – other available papers did not meet these criteria. Ultimately, they both agree that the stress caused by maths anxiety is significant enough to detrimentally effect a student's performance when undertaking examinations. Whilst both papers concur that a way to resolve maths anxiety is a more nurturing approach from educators, facilitating opportunities for confidence building and stress management activities for students both papers contain very scant detail on how this could be incorporated and put into action within the classroom and at what point in a student's academic life would these interventions be at the most effective to include in the curriculum, given the level of investigation undertaken.

In paper one, The Effects of Maths Anxiety, a relatively small sample of one hundred and eighty first year students participated in a survey and allowed researchers access to their standardised maths scores that were achieved prior to starting at College. Patton (1980, cited by Cohen, Louis, et al 2017) suggests that 'there are no rules for sample size in qualitative inquiry' and that the size of the sample should depend on what one wishes to know. Furthermore, Statistic Solutions (2020) suggests that whilst qualitative analysis typically requires a smaller sample size than quantitative analysis, qualitative sample sizes should be large enough to obtain enough data to sufficiently address the research questions. However, the participating students in this study were predominately female (85%) therefore suggesting that the sample size is not big enough to capture the information required without a gender bias. The researchers point to several studies that suggest that maths anxiety is more prominent among female students (Wigfield & Meece, 1988). If this is to be believed, then one could argue the results will most definitely demonstrate a link between anxiety and standardised testing without investigating any further. There was a fairly equal mix of racial classification however, the students that participated were a narrow cohort studying Education, Nursing and Health and Exercise Science with over 50% of these students opting to study nursing taking the earlier points into account, one could argue that the researchers of this paper should have widened the cohort to reach a more mixed gender sample. Nevertheless, of the cohort that took part there were varying levels of mathematical ability which would allow for reasonable exploration of whether starting points could impact the level of anxiety felt by students. Students opted into the study and were asked to complete a fifteen-minute survey about their experiences and allowed researchers access to their previous standardised maths scores achieved before enrolling for college.

The survey was rated on a five-point Likert scale along with the inclusion of the Abbreviated Maths Anxiety Scale (AMAS) and two further subscales, Learning Maths Anxiety (LMA) and Maths Evaluation Anxiety (MEA). There was no opportunity to view the questions asked within the survey, but it would be prudent to be mindful that with a five-point Likert scale, participants may be able and therefore more likely to choose a neutral option, particularly given the circumstances in which they are participating. If a student in fact did suffer with maths anxiety and were continuing their studies in this subject at the afore mentioned college they may well have been concerned about anonymity. Henchel and Roick (2020) state that maths anxiety is particularly heightened in high stakes settings and given that these surveys were completed during the students' summer orientation sessions, could these sessions have been considered high stakes settings, thus contributing to some of the weak correlation results?

The second paper under review, Avoidance Temperament and Social-Evaluative Threat in College Students' Maths Performance: A Mediation Model of Maths and Test Anxiety, is confident from the outset that anxiety is linked to maths testing and suggests that the impact can be so severe students can perform at a level equivalent to a full year behind their age group (Liew, Lench, Kao, Yeh and Kwok, 2014). The study focuses on the roles of avoidance temperament and evaluative threat when undertaking maths testing and maths course grades. Similar to paper one this research also takes into account students previous maths test scores and required students to opt in. However, in this study students were also asked to undertake a short maths assessment followed by a survey which explored individual's feelings around the completion of the assessment. The Adult Temperament Questionnaire (ATQ) and the Behavioural Inhibition Scale (BIS) were embedded within the questionnaire using a five-point scale.

Similarly, to paper one, the sample consisted of one hundred and eighty five first year students, although the students in this instance were predominately White/Caucasian (78.3%). However, in this study students were incentivised and offered partial course credit to take part. A study conducted by Sharp and Pelletier (2006) compared the characteristics and participation rates of students who were recruited to take part in experiments and studies with and without the offer of course credit. They discovered that by using an entirely voluntary sample of participants, as in the case of paper one, participants showed higher levels of self-determined motivation and this can influence the quality of the findings. It would appear that relying on completely voluntary participation may result in a biased sample, with overrepresentation of the more self-determined and motivated individual. Therefore, by offering an incentive such as credit, the sample should represent a more diverse mixture of students.

Again, in this study the sample was predominantly female (71.2%), however the researchers went to some lengths to mitigate this gender bias. Potential gender differences were accounted for by including gender as a covariate predicting all the variables in a hypothesized model, this was then further analysed using a statistical package which was able to provide confidence in the hypothesized model. Ultimately researchers discovered that whilst females have greater test anxiety there were no differences found in gender performance.

As in paper one, when considering the survey, which was completed by students after the maths assessment one has to take into account that the maths assessment may have been considered a 'high stakes' scenario in the eyes of the participants and therefore a desire to not appear less intelligent or less able in comparison to their peer group, scores may have been skewed. Additionally, when students were asked to share verbally their previous

scores from standardised testing some students may well have recalled inaccurately, given the afore mentioned fear. Whereas in paper one the standardised test scores were obtained for the sample from The Office of Institutional Research and therefore one can be more confident in the accuracy of these scores.

Upon reflection both papers demonstrate that maths anxiety is linked to maths testing and that the likelihood is that females are more likely to suffer with it. Similar research methods were undertaken in both studies however paper two presents a more robust attempt to mitigate against the disproportionality of gender in the sample groups by carrying out in depth analysis and employing the use of further statistical tools to give confidence in the data as opposed to paper one which offered little if any mitigation at all. Additionally, the use of incentives to engage students in the research meant that a more diverse group were likely to engage, also there was no limit to the cohort. In paper one there was a narrow selection of students invited to participate based on their major subject of study. However, the research methods in paper one concerning the collection of previous maths scores appears more robust as these are obtained from official sources rather than being reliant on the student's honest disclosure.

A phenomenological approach such as focus groups or interviews could have been adapted with the sample which may have enabled the collection of richer data from which commonality could have been established through individuals' unique experiences, thoughts and feelings around the subject matter of maths anxiety, thus enabling a clearer path for educators to implement some mitigating practises within their delivery for the abatement of maths anxiety. Although one would have to ensure that any willing participants could feel truly comfortable with the approach to gain a real insight into an individual's feelings on this sensitive subject area (Marshall, Mann, Wilson, & Staddon. 2017).

In conclusion reviewing these papers has highlighted potential pitfalls we could fall into during the data gathering stages of the action research project and the critique has allowed us to mitigate against these to some degree. Through our action research we hope to be able to demonstrate a realistic approach to maths delivery that will enable students to make tangible progress in the achievement of their maths qualifications as well as adopting resilience in addressing problems in a wider sense. The implementation and the environment in which the model is delivered is crucial and further examination of the cultures at each of the participating establishments and their ability to embed this model is essential. Further scrutiny of the students' attitudes and behaviours in the various settings where different cultures and strategic priorities will be in play will evidence what truly is the recipe to students successfully overcoming maths anxiety.

Methods

The research population consisted of approximately 150 post-16-year-old students from across the Hampshire region, of all whom were resitting GCSE maths at a further education college. All were studying the GCSE qualification alongside a full-time vocational course of study and chose to opt in to the additional coaching sessions.

It was vital to maintain the confidentiality and anonymity of all participating students particularly given the emotive subject area. Therefore, all questionnaires were designed in such a manner that no personal data was requested. The colleges participating in the coaching only shared headline anonymised data.

All participating students opted into the coaching programme and permission for their progress to be tracked and shared (albeit in an anonymised manner) was sought and agreed.

Students were able to participate in weekly coaching sessions of one hour that took place in addition to their timetabled classes. Twelve coaches were selected from across the participating colleges and to ensure that the maths coaches felt equipped to effectively work with the students, they themselves attended a number of training events teaching them how to model a growth mindset approach and share these skills effectively with their potential coachees. Additionally, they participated in coaching sessions where they were the recipient of coaching. This enabled them to observe best practise and apply this to their own interactions in a meaningful way.

Through the training delivered it was agreed that the interventions would focus equally on supporting students to adopt a growth mindset, as they would focus on maths academic study. There was a keen focus on praising effort no matter whether the outcome had been academically successful or not, the very fact that effort and motivation was present was deemed worthy of praise.

Students were asked to completed questionnaires via Microsoft forms at the beginning of the coaching period, the middle point and the end. Coaching took place over the course of five months.

Questionnaires utilised scale questions so that individuals could not be identified by their responses and the semi structed interviews were recorded with the interviewees permission.

A qualitative data analysis took place where findings were summarised and recurring patterns in the responses to the scaled questionnaires analysed. Data was collected from Microsoft forms which filtered through to excel spreadsheets which in turn were analysed to ascertain the impact of the coaching model.

Additionally, I sought headline data regarding attendance figures for the individual settings alongside anonymised GCSE achievement data. One can be confident in the reliability and validity of the GCSE results data as this is subject to rigorous quality assurance along with attendance reporting.

These data sources allowed for triangulation of results and enabled a clear identification of whether the introduction of a coaching model genuinely can assist students to cope better with their anxieties, improve attendance and make better progress in their mathematical studies.

In addition to the student feedback a small number of semi structured interviews were conducted with maths coaches to discuss and gain insight from a teaching perspective on

the impact of coaching in the classroom and during interventions. These semi-structed interviews were recorded with the interviewees permission and recurring themes are discussed within the analysis.

Results and Discussion

The evidence collated has revealed a number of fundamentals such as, individuals perceptions of their confidence in their mathematical ability, their participation in classes, producing work and interactions with teaching staff. Their feelings about maths assessments and finally, their overall thoughts about maths.

The sample of data was selected from all participating students. However, it is worth noting that the impact of the coronavirus epidemic and the ensuing lockdowns did impact on students participation. This could be due to a variety of reasons and where it is believed that this has affected the data gathered it is discussed in further detail within the chapter.

Maths Confidence

Students were asked to indicate on a Likert scale how confident they were about their mathematical ability, 1 being poor and 6 being confident. The results suggests that the coaching did not impact enough at any stage of the coaching period for students to state, by selecting option 6, that they were *fully* confident about their mathematical ability (see figure 1). Burkhart (2019) tells us that when people begin to lose confidence in their math ability, it can lead to a discouraging cycle in which self-doubt impedes learning, which in turn fuels further self-doubt, so it may be somewhat ambitious to expect a student to state they are fully confident after such a short intervention. However, there was a definite improvement in how confident students felt as they progressed through the coaching period. At the beginning of the study only 32% of students responded positively (selecting 4 and above on the Likert scale) about their mathematical confidence yet at the end of the coaching period this had risen to some 57% clearly demonstrating that coaching did impact somewhat on their feelings regarding their ability.

Looking to individual College data (see Figure 1.1) Colleges four, five and six show an upward trajectory throughout the coaching period with students indicating a steady increase in their confidence. However, Colleges one and two both show an opposite effect with the data at the end of the study showing a significant decline from the data gathered at the beginning. There are potentially two contributing factors that may explain this. Firstly, it is worth noting that both College one and two are inner city colleges that work with high levels of students living in deprivation areas, as indicated in section 4.2. During the coaching time frame the country entered into a third lockdown period, requiring coaching and indeed teaching to move, in the main, to online delivery. NFER conducted a report on students accessing remote learning during the first lockdown in 2020 and reported that 93 per cent of school leaders from the most deprived schools had high proportions of pupils with limited access to IT at home. Additionally, teachers reported that pupils with limited access to IT and/or the space to study were less engaged in remote learning than their classmates. If we apply this to some of the students at College one and two, it would be fair to surmise that potentially these students did not have the opportunities to fully apply the skills acquired through their coaching sessions to the online maths classes, meaning that their confidence in their ability did not develop as quickly as other establishments taking part in the research. Secondly, the coaching model to a large degree relies on the relationship between the coach and coachee. If the coaches were less experienced at College one and two or taking on a dual role (Teacher/coach) this could impact on the success of the coachee and the increase in their confidence.

Figure 1 – Headline data - Question 1.

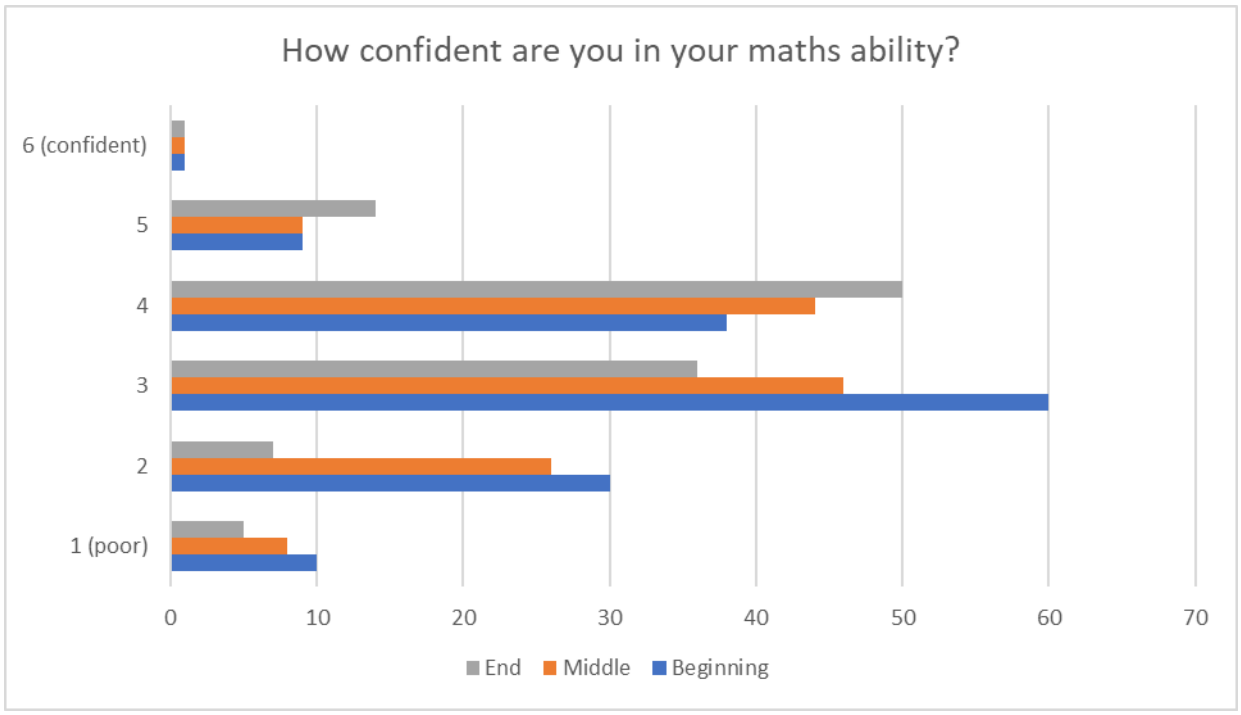
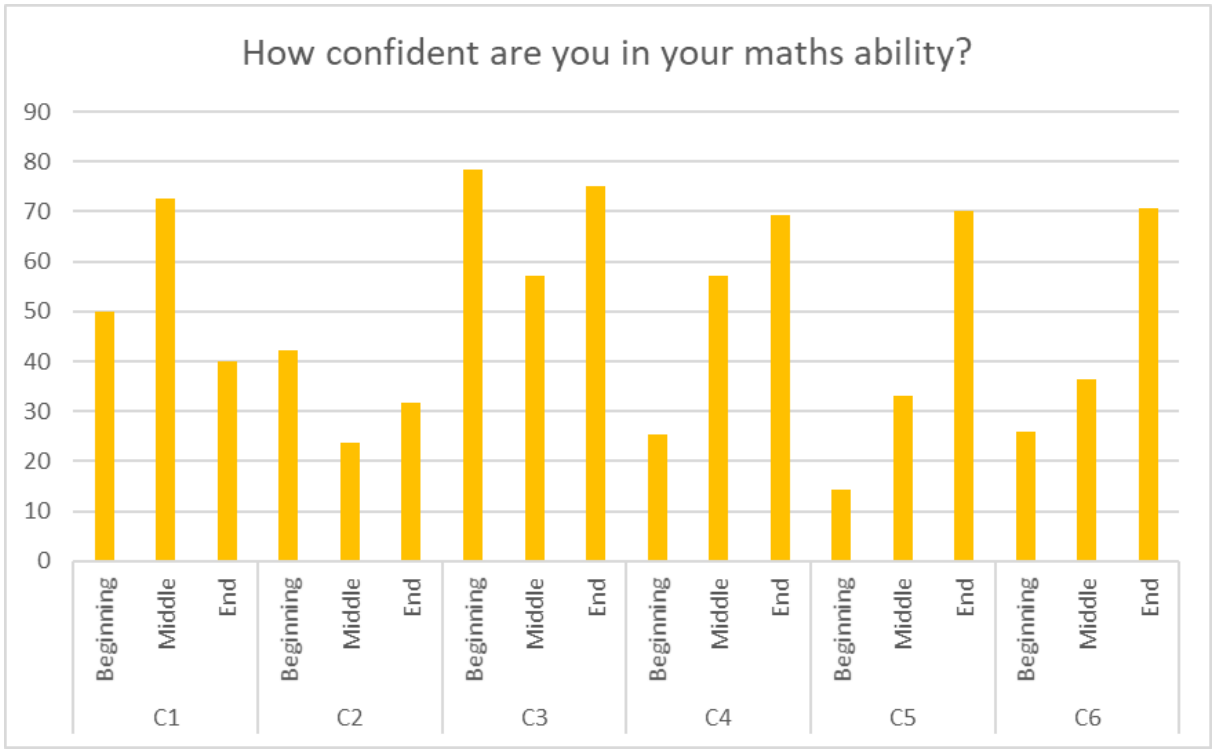


Figure 1.1 – Data by College – Question 1



Participation in maths classes

The headline research data (see Figure 2) indicates a steady improvement in student's perceptions of how their engagement and participation developed through the coaching programme. At the beginning of the study 51% of students responded positively to the question by indicating 4 and above on a Linkert Scale of 1 to 6, with 1 suggesting no participation at all and 6, full participation. By the end of the coaching period this figure had risen to 73%, additionally, no student expressed a score of 1, no participation at all.

It is interesting to note that despite the students' feelings about maths over half at the beginning of the study felt that they participated in class. Participation was defined as joining in, asking teachers for help and producing written work. Evidencing that despite the students' reservations about their mathematical ability a large majority were motivated to improve through classroom engagement.

As previously mentioned at points of the coaching period students were accessing their maths classes online. Online learning presented teachers with a host of new challenges around student engagement. Not only was there the issue of some students not having access to appropriate technology, but also research carried out by the charity Understood by Morin (2021) found that many students struggled to stay on track needing structured support to keep focused. Additionally, students' increased unhappiness about being 'on display' when using cameras or their peer group being able to view their home environment added another layer of anxiety, meaning that the focus wasn't solely on learning.

Whilst the data collected for individual colleges (see Figure 2.2) presented a spikey profile, only College two showed a steady decline in participation across the coaching period. If the suggestion of the increased challenges to engage online due to social economic status is upheld then it is worth considering that College 2 is indeed a inner city college serving high deprivation areas so students may have felt unable to participate fully given the information shared above.

Figure 2 – Headline data – Question 2

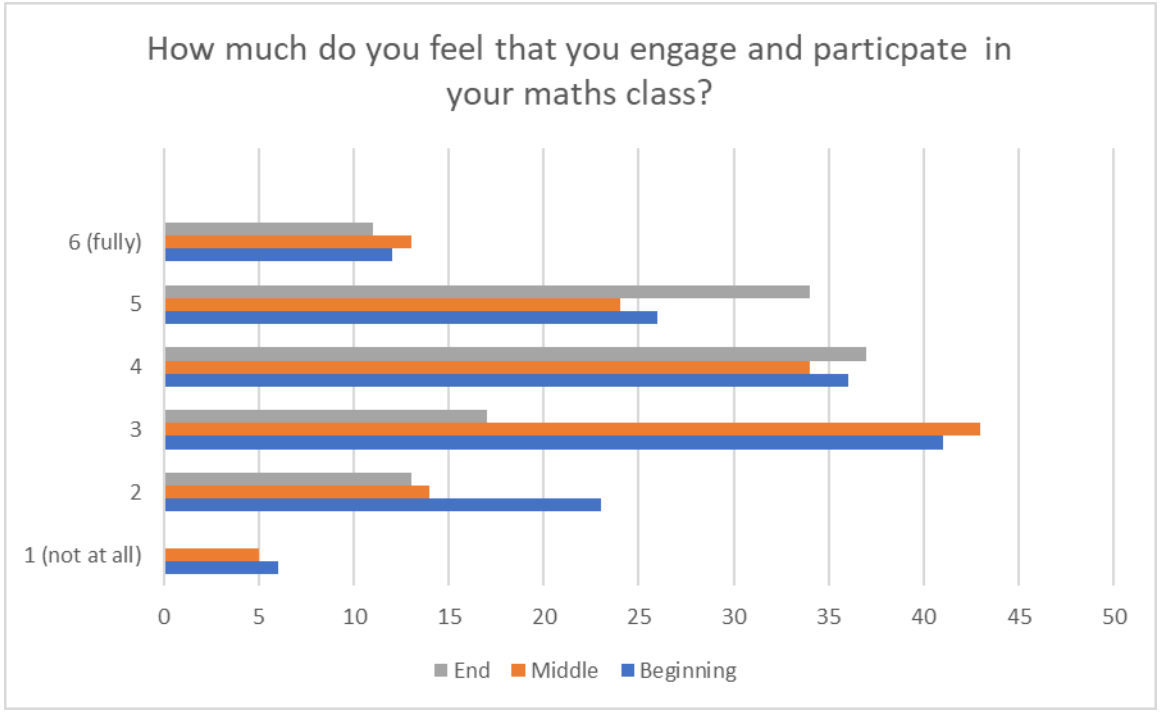
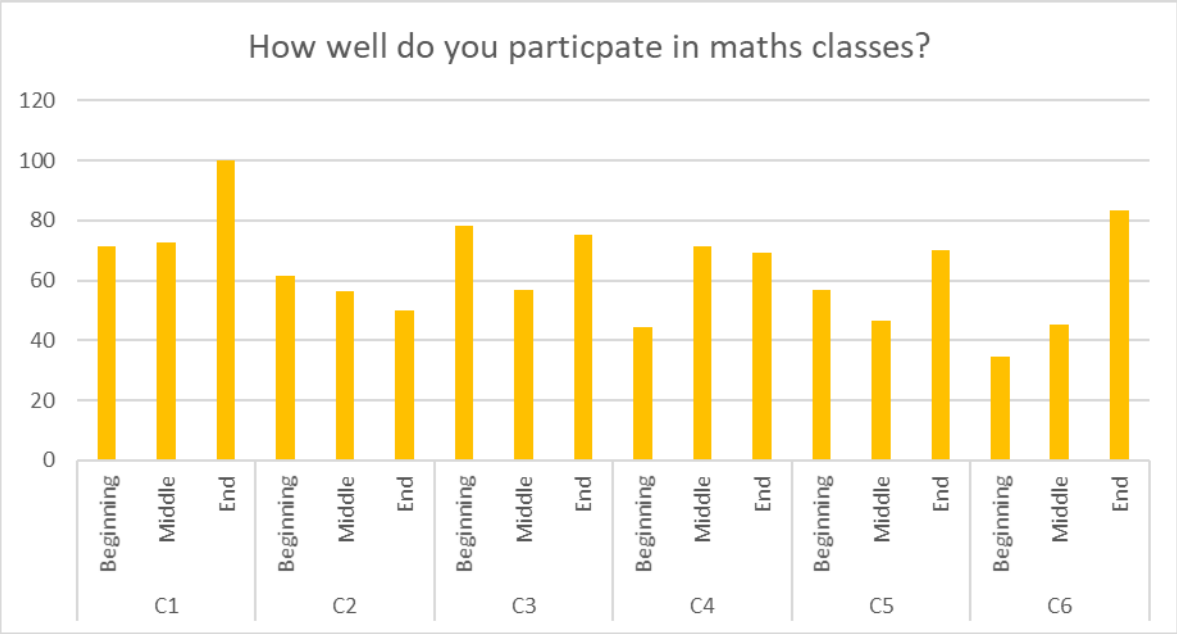


Figure 2.2 – Data by College – Question 2



Maths Assessments

Hill (2015) states that 'it is conceivable that maths anxiety might be associated with more academic problems in secondary education, where the maths curriculum becomes more cognitively demanding, and students are increasingly exposed to 'high-stakes' testing'. Given that maths assessments in further education are as a result of failing the 'high stakes' testing in secondary education it would be fair to assume the anxiety has not decreased and potentially is even more severe within this age group. This may go some way to explaining the extremely negative scoring around maths assessments at the beginning of the coaching period. Some 90% of participating students stated that they were either unhappy or very unhappy about maths assessments. This did improve over the coaching period with the score decreasing to 60% of students stating they were unhappy or very unhappy. The development of a growth mindset approach when facing 'high stakes' scenarios which was endorsed throughout the coaching, we are told by Altaleb (2021) can give students the ability to overcome difficult challenges, in turn encouraging students to believe they can achieve at a higher rate.

This decrease in unhappiness about maths assessments was evident across the majority of colleges (see Figure 3.3) with the exception of College 2 showing only a slight increase. This could be attributed to the announcement by the UK government that GCSE maths testing would again be determined by Teacher Assessed Grades for the summer of 2021. The uncertainty of how each college would approach this task as there was not a clearly defined regulations around this could have been a contributing factor.

Figure 3 – Headline data – Question 3

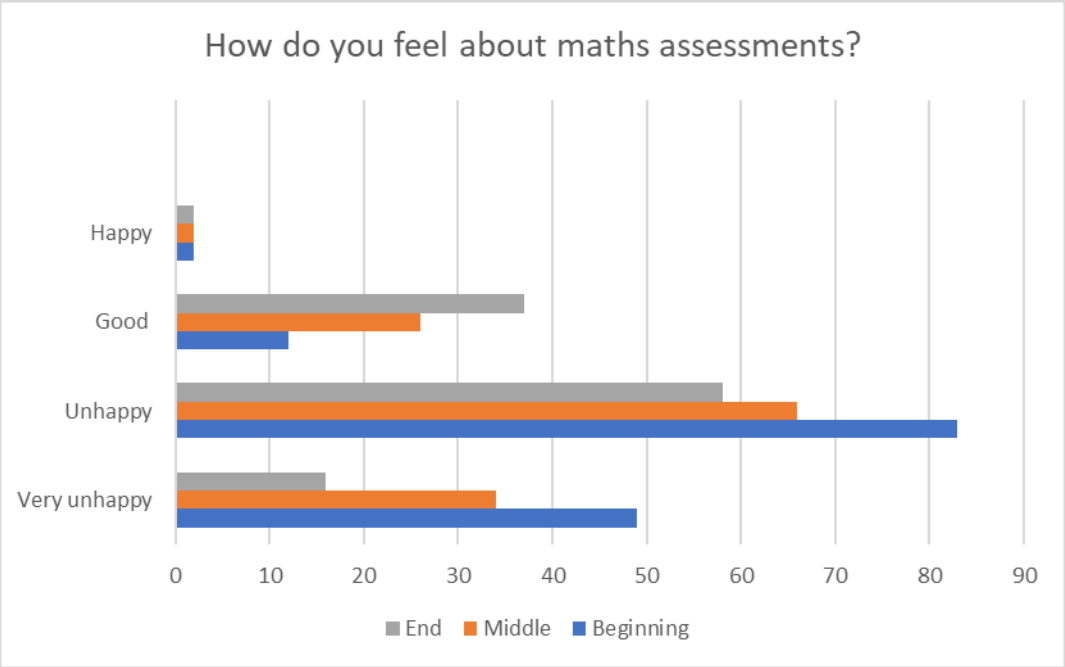
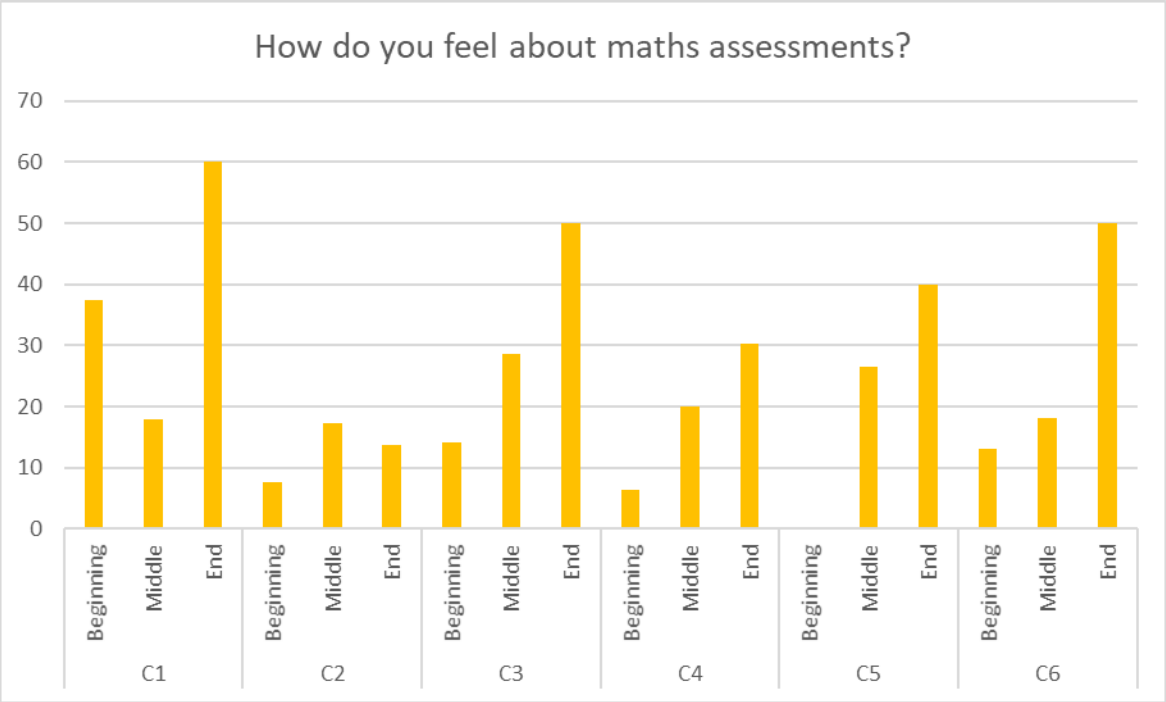


Figure 3.1 – Data by College – Question 3



General maths

Finally, students were asked to rate how they felt about maths overall. The headline data (see Figure 4) demonstrates a significant increase in students' positivity about the subject after undertaking the period of coaching. 32% of participating students responded positively on the Likert scale (1 being anxious, 6 indicating enjoyment) at the beginning of the research

and by the end, this figure had increased to 55%. When looking into individual College data (see Figure 4.4) all participating colleges demonstrate an increase from the initial data collection to the last. Clearly showing that coaching has positively affected students' feelings about their mathematical studies both within the coaching and classroom environment.

Figure 4 – Headline data – Question 4

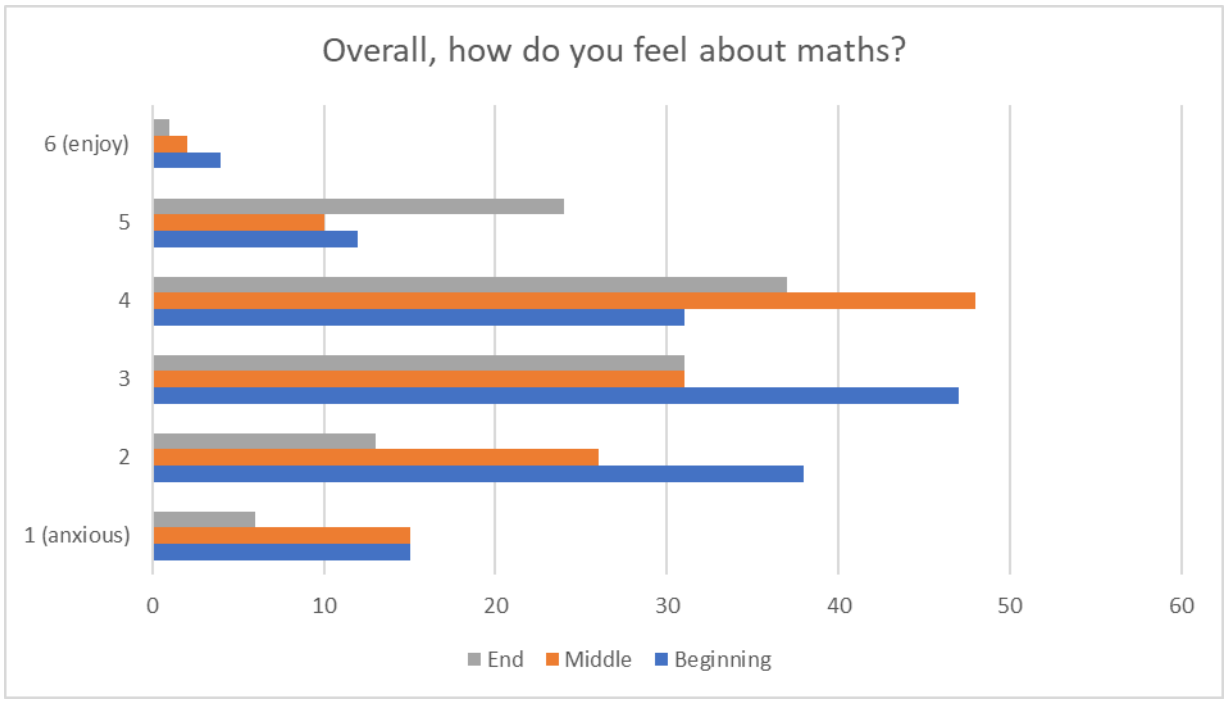
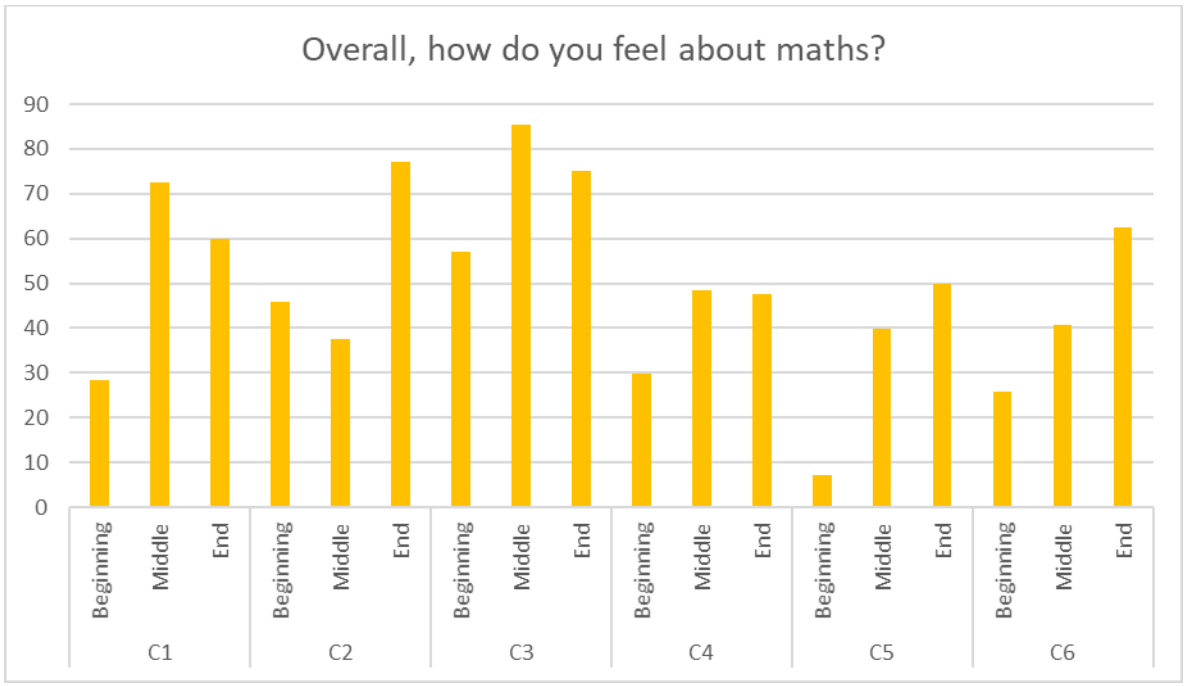


Figure 4.2 – Data by College – Question 4



Teacher/Coach views

The feedback resulting from the short interviews conducted with a selection of the coaches that participated with the research across the six further education establishments echoed the findings from the student questionnaires. The interviews were carried out at the end of the coaching period and questions focused on how students had progressed over the period of coaching and what the coaches felt that the impact of the sessions had been on the students. Where responses featured more than twice they have been included in the results below.

Coaches found that students were more willing to 'give it ago' when presented with written maths tasks.	Students became better problem solving skills.
All Coaches stated that forming a trusting relationship was essential.	Online coaching was not as successful as face to face coaching sessions.
Students demonstrated improved confidence with mental maths and multiplication.	Improved attendance to coaching sessions and extra revision.

It would appear that the longevity of the coaching is an important factor with the coaches all agreeing that a trusting relationship was key to successfully supporting the students. Mammarella, Hill, Devine, Caviola & Szűcs (2015) found through their study into maths anxiety and developmental dyscalculia that maths anxiety is deeply rooted in emotional factors. They go on to declare that maths anxiety is characterized by an anxiety state often elicited by executing mathematical tasks or simply by attending mathematics lessons! Given the severity of negative emotions that some of the students feel, it is essential that they have time to be able to gain trust in their coach and feel confident in the support they will receive in order for them to make initially participate in learning but go on to make progress.

Recommendations

Based on the conclusions for each set of data detailed above I would make the following recommendations:

1. Introduce a growth mindset mentality into the College culture. This could be achieved by facilitating CPD models on growth mindset for all staff that support and teach students undertaking maths GCSE re-sits. This would promote resilience, problem solving skills and enable staff to inspire students through modelling behaviours.
2. Introduce maths coaches to support students with small group interventions and 1:1 support outside of the classroom.
3. Facilitate small group interventions for students that have skills gaps. These can be identified through initial assessment and then focused on for short periods of time allowing the students to progress and master the skill outside of the classroom environment in turn increasing their confidence around the application of this skill in the classroom.
4. Introduce a maths hub area where students will feel less intimidated to 'try' new skills.

5. Coaches to work with individuals on areas of 'missed learning' resulting from initial assessments carried out within the classroom. Facilitating small group interventions to increase the 'reach' of the coaching model.

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