



**CENTRES FOR
EXCELLENCE IN MATHS**



**To increase attainment/progress in GCSE Resit
maths by improving L3 vocational engagement and
motivation with mathematical content in both the
vocational and maths classroom**

C4ME at Grimsby Institute of Further and Higher Education

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Acknowledgements

In this 'COVID-19 era', C4ME wants to initially say a huge well done to every educational staff member – you are all inspirational!

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.

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Background

Introduction

The Centres for Excellence in Maths is a DfE funded project charged with the research and development of teaching and learning in maths in Further Education. There are 21 Centres across England which are hubs for action research, training, innovation, and the sharing of successful practice over the whole FE Sector.

In 2019, over 180,000 students in Further Education were entered for GCSE Maths because they had not reached a “Standard Pass” – grade four – at secondary school (Joint Council for Qualifications, 2019). Of those entered, only one in five achieved a maths grade four (JCQ, 2019). After entering Further Education wearing a label of failure, students often find themselves in a cycle of resits. Most are only released from this by turning 19, rather than achieving a pass (Bellamy, 2017). This policy has drawn a large amount of negative attention.

Who We Are

Grimsby Institute is part of the recently formed TEC Partnership. The Partnership presently comprises the Grimsby Institute, University Centre Grimsby, Scarborough TEC, Skegness TEC, The Academy Grimsby, Career 6 and Modal Training. (TEC Partnership, 2020)

C4ME (Centre for Maths Excellence) is the name of Grimsby Institute’s Centre - we emphasise the FOR part of the programme, highlighting that our raison d’être is to look FOR that excellence.

C4ME is based at the Institute’s Nuns Corner campus in Grimsby. The Institute serves areas which rank very highly for economic, social or education deprivation, recruiting a large proportion of its learners from three wards which rank in the top four of these measures. The catchment of the Institute includes many areas where unemployment is higher than regional and national figures. (Ofsted, 2020)

In the 2021/21 academic year, the Institute had around 13,000 enrolments – including full time learners, part time learners, distance learning, community learning, apprenticeships and 14-16 provision.

Over fifty percent of 16 to 19-year-old learners who enrol at the Institute have not achieved the benchmarked GCSE grade 4 (or C) in English or maths. (Ofsted, 2020)

In 2021/22, the maths cohort consisted of around 1,300 learners, with the vast majority of these enrolled onto GCSE maths.

What We Want

We chose to continue investigating our project that was started at the beginning of last year, looking at Level 3 student's barriers to GCSE maths, in order to gain more insight as to why they cannot pass a Level 2 maths programme but have demonstrated the ability to enter onto a Level 3 programme because of passing a Level 2 English programme.

Our aim is to create a lasting toolkit that future cohorts of students can use. We will do this by investigating motivation and engagement of low-maths achieving L3 automotive and salon learners, identifying factors and influences on individuals and then relating these to progress and achievement, and over all this will ideally have a positive impact on attendance, which is low in the chosen subject areas.

This year we also will focus on working with vocational areas to identify barriers they have and what resources we can produce to help improve progress/attainment of low achieving maths L3 vocational learners.

This report covers a small proportion of the work undertaken by C4ME in its efforts to improve learner outcomes in GCSE Resit Maths.

This report is written by practitioners for practitioners.

Literature Review

Introduction

Level 3 vocational learners who are enrolled onto GCSE mathematics in Further Education are a unique subset of students. They have demonstrated the capability to be accepted onto a Level 3 course, but they are retaking GCSE mathematics, a Level 2 course, because of the national government's Condition of Funding requirement.

This review of literature seeks to identify areas to further research the barriers to a "GCSE Pass" for these Level 3 learners in order to formulate recommendations for practitioners in Further Education to help students gain that elusive grade 4 (Bell, et al., 2020 [1]). The focus of the literature review was to examine the motivation of the Level 3 learner and to discuss measures already in place through the lens of these students.

The Maths Learner

Students working towards their GCSE mathematics in college have already failed the examination at least once and are being "forced" to resit, often only being released from this obligation by turning nineteen years of age (Bellamy, 2017).

The Mathematics in Further Education Colleges report, published in stages from 2018 to 2020, explored students' perspectives on their mathematics studies in detail.

"In several cases, students appeared more motivated by the prospect of being released from studying mathematics than they were about the possible value the qualification might have in the future" (MiFEC Interim Report 3, 2020, p14)

Students are aware that if they cannot achieve their maths GCSE that they can neither progress within their vocational programme (known as main aim course) nor progress into higher education. This, in turn, makes the student "anxious about the consequences of another failure" (MiFEC Interim report 3, 2020 p17).

Forging a New Path – Focused 15

In the previous cycle of action research conducted at Grimsby Institute in 219/20, mastery methods of teaching and learning were explored by this research group (Bell, et al., 2020 [2]). A Scheme of Learning – The Focused 15 (Bell, et al., 2020 [2]) – had been formulated, which edited the GCSE Mathematics specification to suit Further Education learners who are retaking the qualification, not learning it from first principles.

Though reduced, the Focused 15 provides students with enough knowledge (Allan, 2018), so that if the 70 objectives are achieved and the student could complete the course with a grade 5. By using a traditional mastery approach adapted for the modern industry, Further Education mathematics practitioners are able to focus more time (Washburne, 1940) and show different techniques to aid understanding (Morrison, 1926, p79) on the core fundamentals of maths that the student has missed through their learning journey (Washburne, 1940, p319).

Students were aware of the types of maths they could need/use in everyday life and in regards to their chosen vocation because of exposure during their maths sessions. When asked, students identified the areas of maths that they find useful and worth learning, as well as those that they did not [see Appendix 1] (MiFEC, Interim Report 3, 2020, p15).

Students work through a reduced scheme of learning, where the objectives are completely laid out from the beginning of the course and carefully sequenced [EIF REF]. This helps to reduce any feelings of being overwhelmed and anxious as has been highlighted (Davies, et al., 2020).

The impact of this method of delivery needs to be evaluated with a particular focus on the Level 3 learner to feed into the research aim.

Connecting The Dots

In addition, in the previous research cycle, a visual curriculum wheel was designed which covered the objectives, in sequence, for the Focused 15. This was in part a response to the MiFEC report that showed that “students would prefer a more student-centred approach” so students can take ownership of their learning (MiFEC, Interim Report 3, 2020, p20). The wheel helps students identify where they are in their learning progress for the year. We will be taking the concept a step further this year by creating wheels for each vocational area, identifying the maths that is used within each industry, to display in theory rooms and corridors.

“The mathematics embedded into the students’ vocational learning was often seen by students as unconnected to GCSE mathematics and sometimes not recognised as mathematics” [REF]

Too regularly, students have only been able to identify maths that is useful to their vocational practice once a maths tutor has identified it for them, and rarely because of the seamless embedding that should be occurring during their practical and theory lessons (MiFEC, Interim Report 3, 2020, p.16)

The vocational wheels will show the 15 topics (in the same format as the one we use in maths for the cognitive link (Piaget, 1932)) and how the maths relate to their chosen profession to aid the embedding of maths into areas without a maths presence (MiFEC, Interim Report 3, 2020, p16).

Consistency is key in keeping students motivated, if things change this can cause disturbance that can be hard to rectify. By carefully designing a strong concept, we can effectively use resources and questioning to support deeper understanding (Honey, 2018).

Motivating The Masses

The need for the Maths Motivators in the department who can discuss issues students face within the maths classroom is growing. Often, maths anxiety has been passed to the student via a teacher, whether this is through negative thoughts upon the subject or issues with relaying the knowledge (Rycroft-Smith, 2017).

“...Students explained how they were now giving up hope that they would ever pass and becoming reluctant to try: “the more times we do it, the more we’ll give up and start not paying attention.”

Demotivation is the biggest issue with maths resit students. Once a student has given up hope, they begin to become disruptive, frustrated and even regress in their knowledge (MiFEC, Interim Report 3, 2020, p17).

The use of a pastoral member of staff who is removed from the classroom means that there are no previous connotations made by the member of staff and the experience is fresh, open and honest (Anderson and Peart, 2016).

Motivators have been able to identify barriers over the past few years and have developed/learned techniques to help students overcome their barriers. Teachers have found huge improvements in the students’ confidence, motivation and engagement with maths and everyday life (Bell et al. (2020) [1]).

Last year, we faced many timetabling issues throughout the year due to Covid-19 disruption. This created a huge knock on effect on attendance, motivation and engagement. Students who have experienced disruption tended to have reduced attendance levels as they no longer felt confident in the department or their relationship with their teacher. The MiFEC report found that it is difficult for teachers to then come back from the initial impression made, for example:

“Many students had experienced some reorganisation of their mathematics class, either at the outset or mid-year, which made it appear disorganised, such changes

sometimes resulted from staff illness and were temporary but the combining and separating of groups was still disruptive..." (MiFEC, Interim Report 3, 2020, p26)

Part of the motivator role is to uncover and triangulate what support each student needs. When a student is experiencing emotional problems, like anxiety towards maths, the teacher tends to enforce the rule of attendance (MiFEC, Interim Report 3, 2020, p30), which is met with a strong reaction and demotivation to learn (DfE, 2017, p31).

Methods

Starting The Cycle

We started by identifying the outcome we wanted to achieve – this was to create a lasting toolkit that could be used in conjunction with vocational areas to increase attainment/progress in GCSE Resit maths by improving L3 vocational engagement and motivation with mathematical content in both the vocational and maths classroom. By knowing this, we can begin to design research to contribute towards the final aim.

We wanted to first identify what a typical L3 learner looks like: what are their barriers, how can we support them, and what we can put in place to support their maths understanding.

We started by having a discussion with two success coaches (two pastoral members of staff that work within two different vocational areas) about their L3 learners, what they have learnt about them over the years and if there are any barriers that can be seen from an outside perspective in regards to maths.

Once we had identified key themes that the success coaches had mentioned, we wanted to form a focus group of L3, GCSE maths resit learners and ask them questions based on the insight gained. We went through a few questionnaires before we decided to have a small batch of 3 questions that we would be able to get open answers for.

Whilst this was taking place, we had our Maths Motivators (Bell, E., et al., 2020) (pastoral members of staff that work within the maths department that work holistically with students to help them overcome a wide variety of barriers the students face towards GCSE maths) working with L3 students, overcoming maths anxiety, exam anxiety, and negative thoughts/feelings about maths that would be causing a barrier towards their engagement in sessions.

At this point, we realised our research was qualitative as this was the most appropriate form of data we could gain – we would then go on to code the information we were given to then identify what the typical L3 learner looked like.

Confidentiality is Key

In all discussions that we had with students, they are only identified in order to relay the information back to their tutors and vocational areas. For the purpose of our research, students were told beforehand that they would be case studies. However, any information that is discussed will go forward anonymously if they consent to it. This was not an issue for our students as, once they understood that the research conducted could help future students in their position, they were more than happy to contribute towards our research and findings.

The Dreaded 'COVID-19' Bit

We all know that this 'COVID-19 era' has been a strain, but especially on education. College had to transform from face-to-face delivery, to online delivery practically overnight. This drained students, staff, parents, and everyone involved, but the whole sector adapted and continued to deliver the best possible level of education possible.

A lot of our time this year had to be dedicated to helping the maths department with the switch to online and also help with covering lessons/invigilating exams/technical issues/anything else needed, as and when it was needed.

The Data

We used a variety of methods to capture our information. We used questionnaires, focus groups and 1-to-1 interviews. The qualitative data was coded. We used a variety of methods to get a more robust and full picture of what the state of play with L3 students looks like than had previously been attempted.

Below is a table of our research methods, how many students and how many staff (excluding the C4ME team) were involved:

		Interview	Questionnaires	Focus Group	1-to-1s
Number of	Staff	2	0	0	0
	Students	0	471	6	40

The Finalised Aims and Objectives

Our ultimate goal is to be able to understand what a typical level 3 GCSE maths resit learner looks like, what barriers we have identified that cause resistance to maths lessons, how we can work better with vocational areas to improve the overall view of maths around the college, some resources to aid vocational areas with maths embedding.

Results and Discussion

What Do the Staff See?

We had a discussion with two pastoral members of staff (success coaches) about what their typical level 3 learners were like. The staff members were very transparent with their answers and gave the maths teacher-researchers a real feeling of how maths is viewed from outside the department. This discussion has been anonymised.

The struggling students seem to be identified as the progressing L3 learners (usually started their vocational course on L1/2 and have continued learning to L3). This transcends different cohorts. These learners are the ones who are stuck in the cycle of failure.

“Yeah, there's a definitely “here we go again”, and it does feel like they're trapped in a cycle.”

This cycle affects the students in many ways – due to feeling like a failure, they are less likely to attend English and Maths resit sessions. We found out during the interviews there was a separation of the one of the vocational area cohorts into two sub-groups – students that are still working towards gaining their GCSE in Maths/English were timetabled to do their vocational subject lessons at the beginning of the week, whereas students who had already gained these qualifications were timetabled in for the latter half of the week. This separation can cause a division of “winners and failures”, as noted by one interviewee. This insight made us realise that the students that we interact with already feel different and not on par with the other half of their cohort, so we made even more of an effort to keep the conversation in and out of class positive around maths.

When asked if the timetable of a student make a difference to Maths/English the interviewees agreed that if a student has English or Maths on a day on its own, or at the end of a day with no sessions after lunch, the students tend to not attend. Unfortunately, the best way that they have identified combatting this is to have the sessions “sandwiched in between any theory lessons” so the students have “Less chance to escape”.

The college uses 'Canvas' as a virtual learning environment. The maths Canvas page has been developed over the years to be a revision/guidance tool for students who wish to review topics, watch tutorial videos and test themselves against the 'Focused 15' objectives.

Through the pandemic, students and teachers have had to adjust to lessons being held online. As a department, we went through Canvas' 'BigBlueButton' (an online conference platform integrated with our VLE) to host lessons, but it was rapidly apparent that the system wasn't working well. One of the interviewees referred to Canvas as a "minefield", and regardless of the training/support students received to use Canvas and 'BigBlueButton', students still struggled.

The maths department made the decision to move lessons to 'Teams' as it became apparent that the students were much more comfortable using the platform. The platform is more accessible to students as it resembles "Facebook" so the students can relate to it. Teams also has a mobile app with the ability to use "a group chat which is [linked to the] online lesson" giving them a more simplistic and fluid access to their lessons.

"The students can plug the headphones in and join a meeting quite easily on a phone rather than having to login onto a computer and try and access Canvas that way."

Though we have strived to make the online sessions as accessible and easy as possible, there are still many barriers the students face as it is a new way for them to work. One interviewee stated, "I don't think students are enjoying the remote sessions at all, teams or otherwise...". It has also been noted that during these remote students feel like they are being talked at, rather than being an active participant in sessions. This will be down to the tutors' inability to focus on students 1-to-1 and view where they are within the set work.

Each tutor will have a level of comfort with technology that differs from others. Some tutors have found more success in "chalk and talk" methods of teaching during the remote sessions, whereas tutors with a better understanding/confidence with technology are much more likely to create a seamless transition between face-to-face sessions and remote

learning. This is an issue because students are not given the same opportunity and it can be detrimental should the student not identify with a particular teaching style.

Through the interview “consistency” is a recurring theme. If a rule is inconsistent, the student is less likely to follow it. This is the same for attending/engaging in sessions. The interviewees noted that when students were constantly reminded of their maths sessions, from initial enrolment, they were more likely to attend throughout the years, they are aware “that it is an expectation”. Students who were allowed slack with the expectation have fallen into feeling like a failure with no hope of breaking the cycle.

The idea of students being “liberated by their 19th birthday” (Bellamy, 2017) to no longer attend mandatory resit lessons has been noted by both interviewees, “they didn’t care about passing it or failing it, they just cared about not doing it anymore”. Family have also been noted to have an impact in the students understanding of the importance of gaining the qualifications, “They think they’ll be alright because an uncle didn’t do it” which in turn makes the tutors job harder as the student has a reliant family member telling them that it is not important.

When asked about student’s feelings about maths, both interviewees noted that the students weren’t “mouthing off” negatively about maths, but rather explaining that they are finding the work difficult and can’t see the sum through the story. This is down to the student’s comprehension of maths, which can be linked to their level of English understanding. This correlation is interesting and is something that we will be looking at in the future.

Focusing the Group

From the staff interview, we were able to identify questions that we wanted to know more about from a learners' perspective.

We found that there were 20 questions that occurred to us that we wanted to know more about, but found that this could be very overwhelming and take quite a chunk of the student's time. We were mindful that they did not want to be in the maths resit cycle as it stood, so we narrowed the questions down to three:

1. How does your vocational area encourage you to attend and engage with maths?
2. Do you feel a divide between students who have passed EMS and those who haven't?
3. You know you have to attend maths, but if you could choose when you did maths, when would you like it?

These questions meant that we could get a full conversation with the students, they could elaborate and talk in depth about their thoughts, all without feeling under pressure and on the spot.

The Maths Motivators talked to a random sample of 6 L3 students about their thoughts and feelings towards resitting maths. This was an opportunity for the motivators to pin point how the cohort that they don't have 1-to-1 sessions with feel about their maths education to gain a wider understanding. [See appendix 3]

The students were first asked how their vocational area encourages them to attend and engage with maths. Overall, the student's discussed with the Motivators the importance of gaining the qualification for work/apprentices/progression. They also understand that if they do not attend that further action will be taken, with their programme leaders discussing why they haven't attended and how they can make the session up, all the way through to 1-to-1's

with the curriculum manager of their area and warnings for non-attendance without reasonable excuse.

The students were asked next if they felt a divide between the students in their cohort who have passed English and maths to those who hadn't. A divide was noticed by most, especially those who are in mixed level English and maths groups. Students are made aware at the beginning of the year that they will have to attend extra sessions on top of their main aim in order to study towards the compulsory resits. The most startling comments that arose being that multiple L3 students had said how embarrassed they felt by continuing their resit journey to the point that they did not want to ask for clarification or guidance in lesson. The students have avoided gaining insight and knowledge as a coping mechanism to avoid potential ridicule.

Lastly, students were asked when they would prefer to have their maths sessions, if the choice was theirs. We understand that timetabling has a huge impact on maths attendance, if a student has maths timetabled at the end of the day, without a session straight after lunch that they are more likely to not attend, as well as on a Friday afternoon, they are at flight risk after lunch. The responses from the students were mixed. More students opted for morning sessions than the afternoon; more students wanting one double sessions of maths a week; There was a split between students who wanted to have their maths sessions on days that they have practical sessions

The picture that this has created for a typical L3 maths resit learner is one that understands the importance of maths for future life and that there will be consequences for non-attendance, but one who is not happy engaging in sessions due to the cycle of failure repeating and being labelled as such by their lower level peers.

Amalgamated Answers

1. How does your vocational area encourage you to attend and engage with maths?	2. Do you feel a divide between students who have passed EMS and those who haven't?	3. You know you have to attend maths, but if you could choose when you did maths, when would you like it?
Understanding that maths is needed for the future (for industry and progression) CM's take action when a student doesn't attend by discussion their reasons for absence Aware of the importance of attending maths	Divide between L3 resit and lower levels is noted by most Embarrassment prevent L3s from asking for more clarification and guidance Students who are resitting have to attend more days at college than those who have passed	Mixed bag of responses between: Double sessions Sessions to be separated by at least a day On days where they only do theory in session On days that they have practical All agree though that the maths sessions should not be on a day when they don't have main aim sessions so they are more likely to attend

The Maths Motivator Learner

Our maths motivators this year have been working with students, continuing to find their barriers towards GCSE maths resit education, but also to be a support for them during the pandemic – open door policy and available online whenever the student needed them. We now have two new motivators within the C4ME team. This was both the maths motivators first year in the position, so finding their way of working in a holistic and new type of role took its time to refine.

The Motivators both have very different backgrounds and styles of support. One is more of a matriarch figure for the students, and the other is more laid back and receptive to 'bantering'

with students as they had experience working as an assistant in GIFHE classrooms for many years prior. This dynamic works so well as upon the initial meeting on the student, they can each identify which support the student is more receptive to and can then delegate the student from there.

We continued using the 'Learner Portrait Instrument' [see appendix 5] to capture their meetings, identifying key points that have caused a barrier to the students' maths receptiveness.

The maths motivators worked together, going through their meetings with the students to identify common themes that they both found. They categorised the themes into three:

1. Academic
2. Emotional
3. COVID-19

These were the most mentioned areas that occurred and the motivators were able to support the individual student with their need. Below is a table of the typical 'maths motivator learner':

Academic	Emotional	COVID-19	Motivator Input/Solutions
2x GCSE, didn't pass at school, didn't pass at college, now on 3rd attempt.	No self-belief or confidence in passing after previous attempts.	Concerns of catching COVID-19 and spreading to family and friends.	Anxiety techniques – EFT, mindfulness exercises, Well-being advice.

Academic	Emotional	COVID-19	Motivator Input/Solutions
Poor attendance to maths, more concentrating on vocational area as its their chosen career.	No confidence in speaking out in lessons or feel they can talk to maths tutors during lessons.	Concerns over bubbles in college and moving areas to attend different lessons around the college.	Regular meetings in person or via teams.
Move from functional skills to GCSE can be overwhelming the jump in academic levels.	Math's anxiety embedded in themselves from school exams not passed.		Regular communication via teams / email.
SEN, ADHD, ADD not diagnosed or In process, no EAA'S in place.	External influences such as issues with other students in college and class behaviour being disruptive.		Referrals to Maths hub for extra maths support.
Aware maths is not compulsory after the age of 19 whilst studying.	Like structure and routine / same tutors and plan of work for academic year.		COVID advice, masks, sanitizer, distancing etc...

Academic	Emotional	COVID-19	Motivator Input/Solutions
			Look on NHS website/App
	External family concerns leading to poor attendance in lesson.		
	Hormones, Identity, LGBTQ+, emotions.		

The Typical L3 Learner

Throughout our journey, we found what was hardest was being mindful to not 'pigeon hole' students. Each student is different and faces different challenges within the maths classroom and in life. We did, however, want to have a basis of barriers that we can take forward to inform our practice within the classroom from the start of the year. We made an effort to encourage staff not to use negative language around maths, and also to speak with vocational areas about positively promoting maths in lessons.

We took the information given to us from the staff interviews, the questionnaires and the maths motivators, and we coded the information to decide what a typical L3 learner looks like:

Typical L3 Learner:
Cycle of failure is noted
Has poor maths attendance because they want to focus on their main vocation
Has no EAA's in place or is currently awaiting
Aware that their 19th birthday could liberate them from the cycle of failure
Has low self-confidence and does not want to ask for help
Feels embarrassed by speaking out about clarification
Consistency puts in a barrier to receptiveness in lesson, the student 'shuts down'
Struggles to be in classes with lower level students
Has many concerns over COVID safety

Conclusions and Recommendations

Conclusions

Conducting research during the Covid-19 pandemic was exceptionally challenging.

Nevertheless, the small amount of data collected from staff and students suggests a number of characteristics of a 'typical' Level 3 that can inform pedagogy and interventions going forward.

We concluded that students found it hard to self-motivate when they have faced a lot of negativity surrounding maths education, to which they will end up not participating in sessions, not engaging and then overall failing the resit exam and having to complete the cycle again.

We realised that the typical level 3 student is someone who does not want to continue in the cycle of resits and they do feel at a disadvantage to the rest of their 'achieved passing grade' students. This feeling of falling behind the rest of the cohort can make the student want to focus and strive more in their main vocational programme, but leaving their maths course to the wayside.

We can help the student reengage the sessions by promoting maths positively and continually. This would mean having their vocational area change their language about maths, the maths teacher to celebrate maths regularly and to change the overall understanding of resit, that it is a learning journey, not a punishment.

Recommended Approaches

In order to gain the most from the L3 student, the vocational area must have an investment in the learners' maths journey. Although gaining the GCSE is part of the condition of funding for the student to progress, if the vocational area doesn't take that extra time to embed/support the maths learning journey, the student will have a barrier that has been

implemented by the separation of education and will not be equipped to overcome that barrier on their own.

In order to create cohesion between vocational departments and maths departments, we asked programme leaders and heads of departments to stop by the maths office to create a 'matrix' of maths that can be identified within their industry, and we mapped it to the overarching topics of the Focused 15.

The information was displayed in the C4ME 'Focused 15 Wheel' to aid the cognitive processing of maths and the links to the students' chosen industry. These posters were then created on A1 foam board and 3 were delivered to each area for them to display and use in lessons to aid the embedding of maths.

The C4ME team have also developed a 'real life maths' poster [see appendix 3] that has been displayed in communal areas to identify where maths can be seen in everyday life. The idea is to saturate the students with understanding of mathematics in context that the subject no longer causes fear and anxiety, but instead is normalised and correctly understood.

The curriculum that is delivered will always be the most crucial and fundamental part of the maths journey, as it is the content that the student will be graded against. We designed our lessons around the objectives identified in the Focused 15. Some sessions would cover multiple objectives (if they built upon each other, extending the skill) and some were single objectives (should they be self-contained). Each presentation for the lesson had the same visual format and consistent referral back to the Objective and the Focused topic it fell in. Students responded to this well as the lessons were in a continual format and they could keep track of exactly where they were in their learning journey and refer to the wheel to identify where they were going next.

The aim was to give our students every opportunity they could in order to gain their qualification. We utilised our VLEs (virtual learning environment) to be a revision source for the students. We uploaded videos as a guide for each objective, a downloadable worksheet

for each video along with a mark scheme and also used the quiz features to create skills tests based on the Focused 15 topics that could be resat at the students will.

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Appendices

Appendix 1

Not useful		Useful		
Maths for the examination	Maths for other vocational employment	Maths for employment	Maths for everyday life	Maths for own vocational area or employment
Algebra Venn diagrams Geometry (general) Trigonometry Pythagoras' theorem		Basic numeracy	Basic numeracy Percentages (Both in the context of handling money)	Basic numeracy Measurement (e.g. Construction) Handling money (e.g. Hairdressing)

Table 3: Students' perceptions of the usefulness of mathematics

MiFec Interim (2020). *Report 3*. Nottingham: University of Nottingham.

Appendix 2

Initial focus group questions:

1. What level did you start at when you joined GIFHE?
2. How does resitting maths make you feel?
3. How do you feel about attending maths sessions?
4. Do you feel a divide between the students who have passed Maths and English to those that haven't?
5. If it were up to you, when would you have your maths session scheduled for?
6. Are you more likely to attend maths if it were surrounded by vocational lessons?
7. How have you coped with lessons moving online during the pandemic?
8. Did you attend any maths sessions that were held through Canvas?
9. (If 'Yes' to the Canvas question) Do you prefer Teams to Canvas?
10. Did you find Teams easy to use initially?
11. Do you use Teams to communicate with your peers?
12. Do you prefer Teams lessons to Canvas based lessons?
13. During remote sessions, do you personally get asked if you understand or to answer a question?
14. What was your experience going from f2f lessons to online lessons?
15. Does the pressure from vocational areas encourage you to push yourself in maths?
16. Does turning 19 mean anything to you in terms of maths?
17. Do your family/guardian(s) have any thoughts about you resitting maths?
18. Does your family/guardian understand the importance of GCSE maths?
19. When you come across a question that's harder, how do you approach it? [Break it down, RAG system, leave it, etc]
20. Do you find the longer, story based questions harder to understand?

Appendix 3

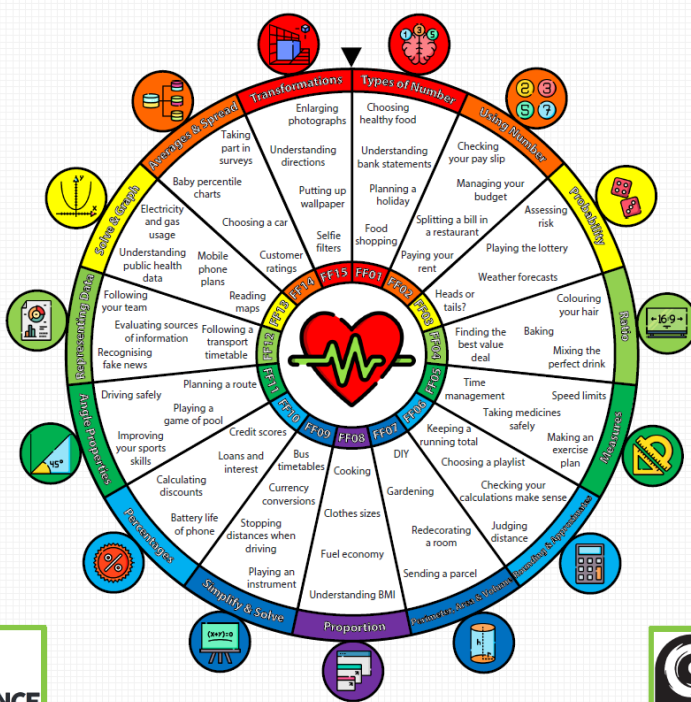
Focus group questions and answers

Student	1. How does your vocational area encourage you to attend and engage with maths?	2. Do you feel a divide between students who have passed EMS and those who haven't?	3. You know you have to attend maths, but if you could choose when you did maths, when would you like it?
1	Will affect the course and in the future Won't be able to work in the future without maths Have passed English at least	Do feel different - embarrassed Lower levels have passed Sharing [the maths classroom] with different levels Don't like to ask questions in front of the lower, younger cohorts.	In-between lessons - morning.
2	Attendance, must attend or it effects the course Working with kids and will need maths Warnings Need at least 1 pass in either maths or English to progress to Level 3	Embarrassed 3rd year, haven't passed, yet some level 1s & 2s have Sharing classes, feel stupid asking in front of lower level learners	Double session on one day Beginning to middle of the day OR main course then maths at the end of the day
3	Tutor encourages If we miss a session, the CM will know and we will have to discuss if we have a reasonable excuse for not being in	No divide as I am sitting both There are only Level 3s in my class, never a mixed group	2 separate afternoon sessions After practical sessions to avoid burnout
4	Tutor loves maths and encourages every week Consequences for missed lessons and a 1-to-1 to know why when 3 are missed, with more missed it's a meeting with the CM	No, I am aware that I have work to do to pass English and maths No mixed groups so no divide	No double sessions Not on a day when it's all theory in vocational area. Split over 3 days so we have a days break in-between maths sessions
5	I am aware I have to attend Disciplinary from management downwards (main aim tutors get in trouble if we don't attend)	There is a divide because the ones who don't have to resit don't have to come in on the days that we have maths or English	A day that I am already in college as I currently have to do double maths on a day that I don't have main aim sessions
6	Need for apprentices or have to complete maths another year	Treated fairly, I have to only resit maths because I have passed English Some in the group have passed maths but not English	Double session in the morning on theory days to keep practical on full practical days

Maths for Professionals Example (all iterations can be found here: <https://padlet.com/c4me/f15>):

[illegible]

Maths for Life



Appendix 5

Worked learner portrait instrument (anonymised)

Learner Portrait Instrument		C4ME + = × ÷
What are the barriers to maths achievement for students who are on a Level 3 vocational programme but studying GCSE Maths Resit?		
Learner Information Name: [REDACTED] Age: [REDACTED] Years in cycle: [REDACTED]	GCSE Grades Maths: GCSE - 2 English:	Attendance(%) Vocational: Maths: English:
Vocational Information Area: fab + weld Level: 1 2 3 + PL: [REDACTED] Success Coach: [REDACTED]		
Additional Information [REDACTED] [REDACTED]		
Snapshot Referred - [REDACTED] Support Session - barriers - School - Tag - Park enjoyed Math 7-9 year 10-11-good 11-Bad experience Testing - Dyslexia - Maths tutor. Skills Building to be arranged - [REDACTED] - [REDACTED]		
Canvas Work Quizes Confidence building. Motivation - Math Exam Anxiety		Self-identified Barriers Time it takes to do Sums Used to be good and enjoy Maths. Confidence building Motivation - Exam Anxiety