CENTRES FOR EXCELLENCE IN MATHS

Is it possible to use assessments to identify common skills gaps of GCSE resit students, and can these gaps be filled through retrieval techniques?

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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

Working with Maths GCSE resit students coming from a variety of different schools and colleges we found that it was difficult for staff to know where students had gaps in their prior knowledge and how to direct their teaching. We chose to research whether it is possible to use assessment to identify skills gaps of Maths GCSE resit students and whether retrieval techniques would be an effective method of filling these gaps.

We first completed an initial assessment using past exam questions, and then resorted to using diagnostic style multiple choice questions to try to identify the gaps. Approximately 150 students were involved in this study. Once we had decided on some topics most likely to be skills gaps for these students, we formulated a set of retrieval sheets. These contained 8 questions and were completed by students every lesson for a period of 16 lessons, the time period covered varied in the different centres.

Data was collected through the use of Microsoft Forms for surveys of students and staff, exam tracking using Microsoft Excel, and students kept their own tracking sheets to keep a record of their retrieval sheet scores.

We found that exam questions were a poor method of identifying skills gaps, with skills based diagnostic questions more useful as long as the length of the assessment was reasonable. A shorter assessment would have made the results more manageable for analytical purposes. The retrieval sheets were useful and appreciated by the majority of students, however many found them to be repetitive. Definite improvements in scores were observed although no significant improvement in overall Grade for students was noted.

Contents

Background

Introduction

Wilberforce Sixth Form College is situated in East Hull and provides a service to a very deprived community. Many of the students who enrol at the College have very low attainment at school matched with low aspirations. Some 49.3% of students in this College are in Deprivation Band 1 (worst), compared to a national average of 15.2%. An additional 32.4% are in Deprivation Bands 2-5 and, on average, the College has an annual intake of circa 800 students who have not achieved a Level 2 English and/or maths qualification whilst at school. 78% of the students at the College are first-generation Higher Education applicants and the current unemployment rate across the city is at 8.7%. The college is all on one site and offers students a mixture of Vocational and A-Level courses. The maths provision the college offers is Functional Skills Level 1 for those students enrolling with a grade 1 or 2 at GCSE, Foundation GCSE for those students enrolling with grade 3 and A Level Mathematics and Further Mathematics for those students wishing to study the courses and have achieved a minimum of a grade 6 at GCSE. The college would typically have around 120 students on the Functional Level 1 course and 200 students on the GCSE course. For A Level the numbers having been dropping over the last 5 years with the last cohort of students being only 28, down from 42 the year before.

Maths Department

We use a centralised model for teaching with all lessons taking place in the 'Maths' block and all teachers having their own classrooms, which are only used for maths teaching and are fully resourced. Three teachers teach on all courses, and we have two teachers who just teach resit students. Of the five staff, two are Early Career Teachers and the other three all have 10 years + experience and have held various roles throughout their careers. It is worth noting that the department has experienced high staff turnover in the last 6 years and the current staff are mostly new. The department is part of the STEM faculty, the Head of Faculty is a biology teacher. This situation will be changing in in September 2022 with the introduction of a new Head of Department whose specialism subject is Business. Within the department there is an additional role of Cross College Maths Coordinator, the post holder here takes the lead on the GCSE and FS courses.

The students come to the college from a range of different institutions; although the majority come from the immediate area; some come from significantly further afield. The wide-ranging nature of the student body means that their previous Mathematical experiences are also varied, having a range of teaching methods, different pedagogical models, and even different exam boards.

Research Aim

We initially considered a primary focus on mastery methods for our action research project for this academic year. We looked at the idea of not moving on until everyone had mastered each skill, however we quickly came to the realisation that as a college working with GCSE resit students this would be much more difficult than in a school setting. As mentioned, student experiences and skills were varied, which led us to our main focus of gap filling. We realised that to be able to fill in students' gaps in understanding we would first need to identify those gaps. Our initial reading emphasised this point and we decided to go down the common practice in Maths teaching of using exam questions. This led us to open further questioning and research into whether it is possible to identify the gaps. And once identified is it then possible to fill them using mastery style methods.

Literature Review

Introduction:

Too often struggling students are falling further and further behind their contemporaries because their lack of understanding of prior content is preventing them from learning new material (Star, n.d.). Maths GCSE resit students have generally already failed the subject at least once, with second- and third-year students having failed several times. They have already spent many years studying the subject without achieving the requisite grade to move on. Clearly a system that is based on the same notions of teaching the entire specification as is taught over two years in secondary education is unlikely to succeed in Further Education where it had previously failed. Ihendinihu (2013) puts forward that "although many factors affect a student's mathematics learning and achievement, one factor over which schools have the most immediate control is the choice of mathematics program to be implemented by teachers". Higton et al. (2017) suggest that FE teaching should focus on closing student's learning gaps rather than on covering the whole course content. Adding to the challenge, it has been suggested that there is a variance in both quality of teaching and level of experience of teachers in FE, particularly for GCSE resit subjects (Haywood and Horner, 2016).

Definitions:

Before discussing theories and current practice of ideas relevant to this project, it is important to define these ideas:

- **Learning Gaps:**

'Learning gaps are the difference between what a student is expected to have learned by a certain grade level versus what they have actually learned up to that point' Davis (2020).

- **Threshold Concepts:**

A threshold concept is something which a student requires to access more advanced topics. The threshold concepts allow students to access a topic which would be inaccessible without that concept (Didau, 2015).

- **Diagnosis:**

"diagnosis may assume an instructional definition in which assessment results provide information about students' mastery of relevant prior knowledge and skills within the domain as well as preconceptions or misconceptions about the material (Ketterlin-Geller and Yovanoff, 2009).

- **Diagnostic Testing:**

Higton et al. (2017) stated that the aims of diagnostic testing are usually to identify students': current level; existing knowledge of topics; proficiency with routine tasks; gaps in knowledge; and additional support needs.

- **Skills Analysis:**

"Skills analysis involves aggregating students' item-level responses to determine skill mastery associated with specific subskills" (Ketterlin-Geller and Yovanoff, 2009).

- **Formative Assessment:**

Formative assessment can be defined as “the process used by teachers and students to recognize and respond to student learning in order to enhance that learning, during the learning.” (Cowie and Bell, 1999).

Learning Gaps:

- **Theory:**

Davis (2020) recognises that learning gaps are ‘compounding’ – meaning that if they are not addressed the students will likely fall further behind as they have missed the essential skills and knowledge they need to progress. Where these missed skills are threshold concepts, the problem is even more problematic.

Certain topics can be described as threshold concepts as they have the following characteristics, they are transformative, irreversible, integrative, bounded and troublesome (Cousin, 2010). Worsley et al. (2012) describe threshold concepts as “concepts that are essential to knowledge and understanding within particular disciplines”; and suggest that they “act like doorways that once crossed enable students to comprehend a topic not previously understood” thus allowing to progress to higher levels of learning and able to access higher skills. It is this transformative nature of the process that can be the most troublesome for both students and teachers. It involves a complete shift in the way of seeing certain problems and once a student has mastered the threshold concept calculations are seen in a totally different light (Worsley et al., 2012). As Cousins (2010) discusses, the process is irreversible, once the learner fully understands the concept it is unlikely that they will forget it. This is where the problem lies for teachers, they are unable to remember a time when they were unable to understand these underlying concepts in the early stages of their own learning. As teachers have already mastered the threshold concept, they often forget how difficult it is to understand these concepts (Didau, 2015), and subsequently fail to ensure they are fully embedded in the understanding of the students before moving on.

The Coronavirus pandemic has only served to exacerbate the already existing issue of wide and varying learning gaps, particularly amongst GCSE resit students. As the government seeks to close these gaps with its catch-up campaign with additional funding for intervention, the question has to be how to do this effectively. Davis (2020) suggests that to combat the learning gaps brought about by Covid-19 the first step must be to identify them. Wilson (2012) identifies assessment as an essential element of the learning cycle, claiming that it is through assessment that we come to know our students. However, appropriately identifying these learning gaps isn’t always as easy as it would appear to be.

- **Current Practice:**

Diagnostic assessments are critical to bridging any learning gaps that develop amongst students, and Davis (2020) suggests that teachers must start the year with comprehensive diagnostic assessment. Higton et al. (2017) noted that results from diagnostic tests can be used formatively, and some teachers incorporate formative assessment in lessons through progression tests and collaborative exercises such as peer marking. Teachers use diagnostic information to adjust instruction by identifying

which areas students have and have not mastered. This results in varied instructional plans that are responsive to students' needs (Fuchs, et al., 2003).

As common practice with FE in England, teachers would use a skills analysis from a past paper as an early indication of the strengths and weaknesses of students, using this as a way to focus particular emphasis in teaching. Throughout the year students are then often assessed on the topics that they have been covering most recently in small topic assessments, before again being faced with a whole exam paper for mock exams. Rarely are students given entirely skills-based assessments. This strategy, although giving a reasonable idea of the current skill level of students, is not necessarily the most useful identifier of learning gaps for either individuals or cohorts of students. This is particularly the case when it comes to threshold concepts.

One way of ameliorating this and of "identifying students' misunderstanding in mathematics is error analysis" (Ketterlin-Geller and Yovanoff, 2009). This involves categorising errors into two groups: slips and bugs; with slips being a random error that is not indicative of a gap in knowledge or misunderstanding; and bugs being a persistent misconception that will consistently interfere with student's abilities. As noted by Christ, et al., (2008) "variability in test material decreases the dependability of measurement outcomes, because the number of items that represent specific domains is uncontrolled and inconsistent". Craig Barton (2018) however suggests that good diagnostic questions can help you identify and understand both mistakes and misconceptions.

Mastery Approaches:

"Mastery learning as an instructional strategy is based on the principle that all the students can learn a set of reasonable objectives with appropriate instruction and sufficient time to learn" (Ihendinihu, 2013). When following a mastery strategy or scheme of work individual students are not moved on to the next topic or area of the curriculum until they have sufficiently shown that they have "mastered" the current topic.

> "Failure to learn prerequisite skills is likely to interfere with student's learning of later skills. In mathematics, concepts are inter-related and inter-woven and any student who fails to master the pre-requisite to a particular topic may not be able to master the topic." (Ihendinihu, 2013).

Therefore, any students who subsequently do not achieve mastery of this topic should then be given extra intervention through a variety of different methods including "tutoring, peer mentoring, small group discussions, or additional homework" (Ihendinihu, 2013).

- **Research in Mastery techniques**:

Kreiner (2006) carried out research into an online version of a Statistics for the Behavioural Sciences module which used a self-paced mastery approach to learning. This was a degree level course; however, the overriding principles, objectives and conclusions can broadly be applied in an FE context. Units were set up so that "if the student does not correctly answer a review question in the tutorial, the student is

returned to the beginning of that section" (Kreiner, 2006). This meant that students were not able to progress further until they have successfully mastered a given section. This was backed up with further "mastery" style homework. These were set online, and responses were to be emailed to their instructor. "If the problems are not completed correctly, the instructor emails feedback to the student. The homework assignments must be resubmitted until everything is correct" (Kreiner, 2006). Students were also required to "pass a twenty-item multiple choice quiz with a score of at least 18 correct…. A student who does not pass a quiz must wait at least one day before retaking the quiz. Each quiz must be taken until it is passed" (Kreiner, 2006). In order to assess the results and analyse the efficacy of this methodology identical pre and post tests were given to students. This exam consisted of 100 multiple choice questions. "There were large differences between the pre-test and final exam scores for both sections…. Mean score increased from 39.52 on the pretest to 76.13 on the final" (Kreiner, 2006).

Kreiner's found that the use of this combination of various mastery approaches had a significant impact on the outcomes for students. He does however suggest a number of drawbacks to using this method, particularly in relation to required levels of student engagement and teacher workload. He states both that "a notable problem with using the self-paced, mastery approach is that not all students complete the required material" and that "the instructor must invest a large amount of time to develop course materials and to provide prompt feedback to students" (Kreiner, 2006). For this sort of approach to work within FE for Resit Maths students it would be better to remove some of the self-led aspect, perhaps by paring down the different methods trialled.

Ihendinihu (2013) discusses a research study carried out in three schools in Abia State, Nigeria. Mastery learning approaches were used over a period of 6 weeks. Students were split into 3 groups: one was taught mastery; one was taught mastery with collaboration skills, and one was a control group. Students were all given the same pre- and post-test. This data was then analysed to assess whether mastery teaching had an impact. Mastery learning approach was found to be effective in enhancing the achievement of students in mathematics and it helped bridge the gap between high and low ability students. Groups one and two who received interventions significantly out-scored group 3 (the control group) in the final test (Ihendinihu, 2013). Again, this definitely suggests that a mastery learning approach, whether collaborative or individual, does have a positive impact on student outcomes and progression. Although this research was carried out in Nigeria, the outcomes appear applicable to a British FE setting.

Mastery approaches for bridging learning gaps:

Due to the nature of FE colleges, and GCSE resit in particular, a different approach needs to be used when attempting to bridge learning gaps, particularly as the students have often come from a variety of settings. Successful teaching strategies are likely to use a range of learning activities, such as group discussion or paired working – rather than approaches generally used in school, such as "explanation-example-exercises" (ETF, 2014). While there is no easy solution to this challenging situation, the advice given by Star (n.d) would be to separate the aims of filling in learning gaps and teaching current material. He suggests devoting instructional time daily to filling gaps. Exposing students to mathematics problems that include tasks from prior years and units. He recommends that this can be done through "do now" or warm-up exercises, additions to homework assignments, or even test problems. (Star, n.d.)

Conclusion:

For the first part of our research will need to ascertain what learning gaps our students have. This is particularly problematic as our students come to our FE college from many different institutions. This perhaps is an area for us to delve more deeply into, whether the original institution of each student makes them more or less likely to have common learning gaps.

We will attempt to focus on the topic areas most likely to form a part of the threshold concepts in Maths and for this reason we will narrow down our area of gap identification to Number topics.

We will use a skills analysis spreadsheet to then identify any topics that stand out as common gaps before applying error analysis to determine whether these are likely to be mistakes or misconceptions (the slips or bugs described by (Ketterlin-Geller and Yovanoff, 2009).

We will then use a range of mastery techniques to fill these gaps, both collaborative and self-paced, before re-assessing to determine efficacy.

Methods

This investigation focussed on two areas. In cycle one we concentrated our research on the extent to which it is possible to identify skills gaps using assessment materials; which type of assessment was most effective; and to what extent it is possible to identify skills gaps in a resit setting.

In cycle two we looked at how effective selected mastery methods were at filling any identified gaps. We focussed primarily on a retrieval style method, backed up with further techniques such as visual representations and repetitive practice. Both cycles were narrowed down to number topics as we considered these to be most likely to threshold concepts enabling or hindering future learning.

We initially explored current practise and research in the area of assessment during cycle one before discussing as a research group and adapting to a method designed to be more suitable for our students. We mainly used a quantitative approach here analysing question by question averages. In Cycle 2 we designed a retrieval sheet to attempt to fill the gaps identified in cycle 1. We used a mixed qualitative and quantitative approach here, looking at both student scores and grade improvements alongside more opinion-based commentary from both staff and students. In both cycles all elements were designed collaboratively with full input from the entire research group.

All data was held securely in password protected areas of Padlet to only be accessed by relevant ARG staff. All students completed forms consenting to their data being collected for the purpose of this research and everyone involved was assured anonymity in their responses. The research included 8 members of staff and approximately 150 students.

Although the Covid pandemic had a significantly lesser impact on education this academic year it still certainly attributed challenges to our research. Predominantly in the varied starting point of students and its impact on skills gaps. This will be discussed to a greater extent when examining cycle 1 results.

Results and Discussion

Cycle 1a – Actions and Intervention

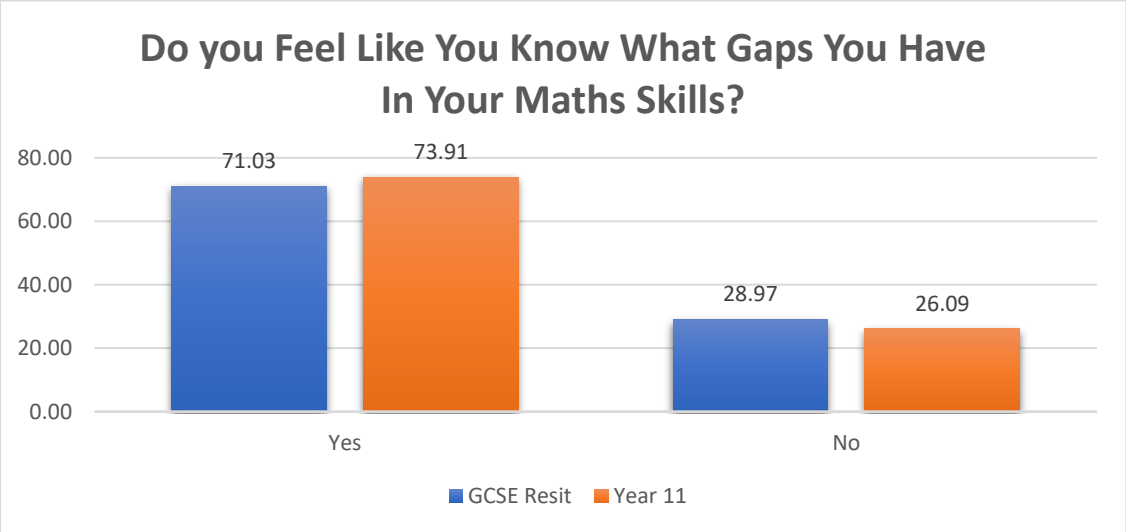
We wanted to start by getting an idea of whether the students were able to articulate their own understanding of the gaps in their mathematical skills; so, we created and disseminated a survey asking whether they knew what their gaps were and whether they knew how to fill those gaps.

As the most commonly used method of assessing students' overall understanding in Maths is through the use of whole exam papers or exam questions; we created an initial assessment for students to complete using Pearson's ExamWizard. Having completed some initial reading, we wanted to focus on Number topics as we considered them most likely to be threshold concepts. We used all topics flagged as containing an element of a number topic from the June 2017 Edexcel Papers, and created one non-calculator paper and one calculator paper.

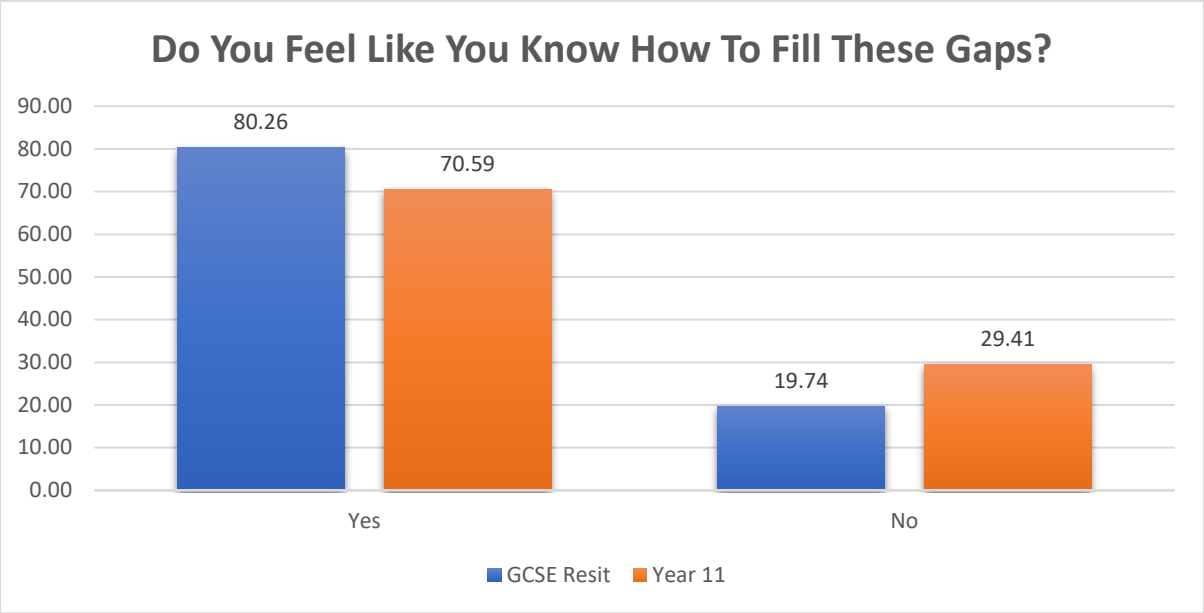
All students involved in the Action Research project sat this initial assessment under timed conditions. Staff then entered the results question by question into a spreadsheet we formulated to analyse and identify any common gaps. As a research group we then interrogated these results.

Cycle 1a - Results

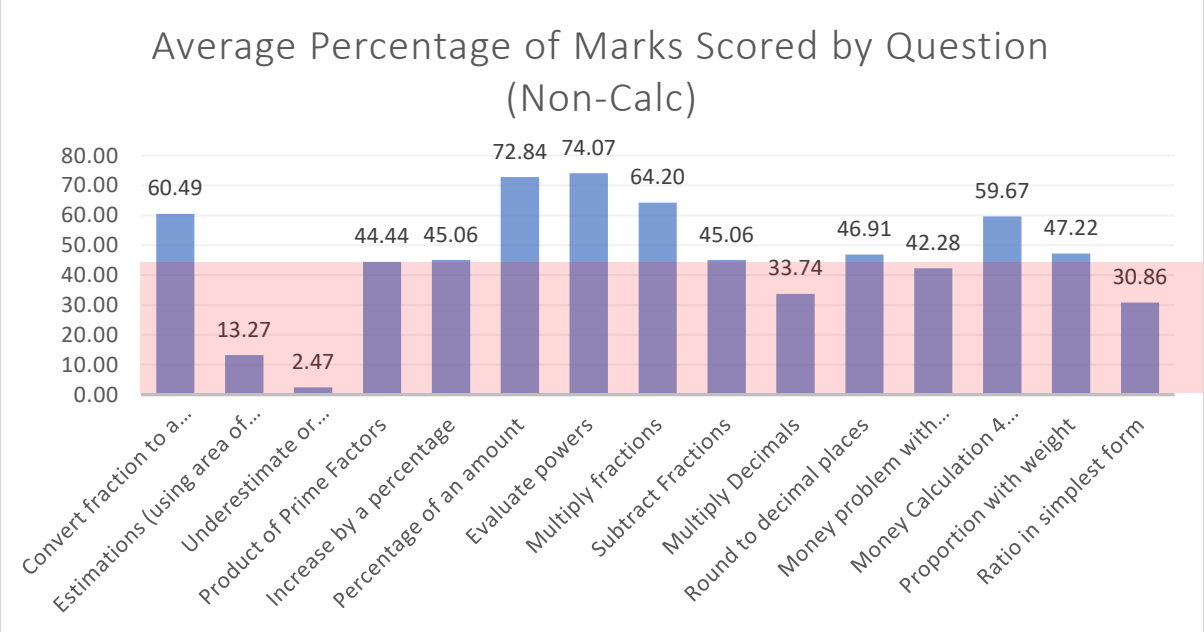
When students were asked whether they felt that they knew what gaps they had the majority said yes, for both students that were in year 11 the previous year and those that had already resat Maths GCSE.

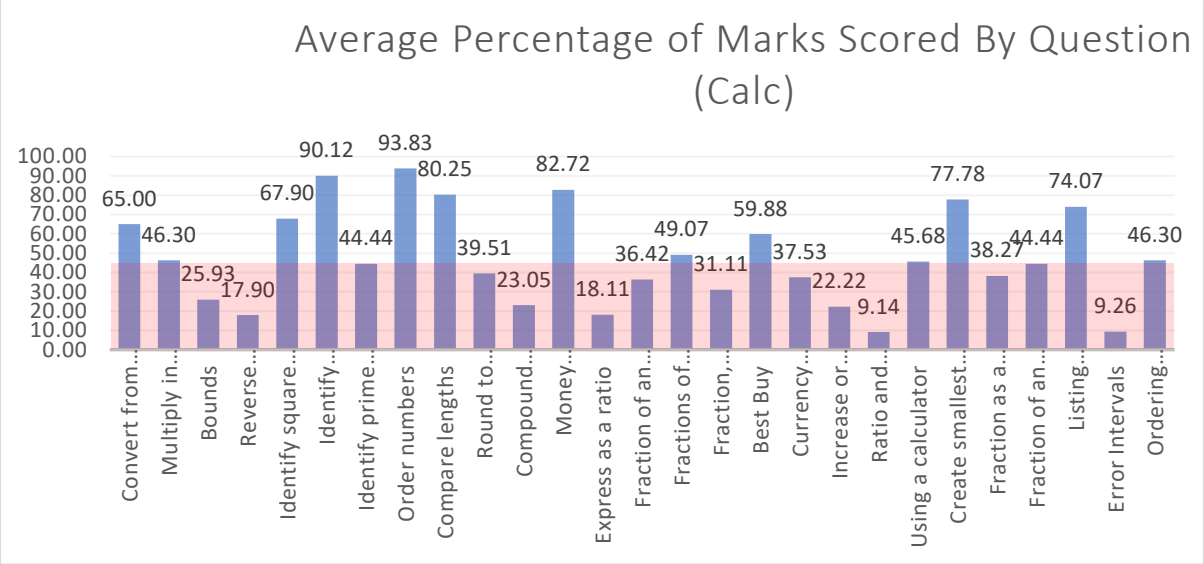


Interestingly, students who had resat GCSE the previous year; were more likely to feel that they knew how to fill those gaps, with 80% saying "yes" compared to around 70% of first time resitters.



When we analysed the results from the initial assessment, we used a below 45% accuracy threshold for further intervention. This identified a considerable number of questions, far more than we thought reasonable for the purposes of gap filling. So, we looked back at the questions highlighted, and it seemed that in a number of cases it was likely that the issue was literacy based, or cross-topic misunderstandings, rather than specific skills gaps in the areas we were focussing on. For example, the question labelled estimations, seemed to be answered incorrectly due to the inclusion of the Area of a circle etc.





Cycle 1b – Actions and Intervention

Having failed to identify any overwhelming skills gaps through our exam-based questioning we turned away from this methodology and went back to our literature review to find a different way of assessing students. We wanted to strip out any of the issues we had had with literacy and cross-topic questions.

The main topic areas highlighted by the initial assessment were used to create an EEDI assessment. This contained 80 questions covering 16 different topics. We chose to include five of each topic to allow for any slips.

We then attempted to analyse these results again with the hope of identifying definitive skills gaps of our resit students.

Cycle 1b – Results

We found that by including 80 questions, split over 4 separate EEDI assessments our results were completely unmanageable. Many students failed to complete all four of the assessments, rendering their scores unusable. Other students seemed to get bored or worn down during the process and began to “guess” the answers rather than working them out. The time taken was also extensive. All of the topics assessed flagged up issues for many students, but results were intermittent and unreliable.

Cycle 2 – Actions and Intervention

Our second cycle intended to focus on filling the gaps identified in cycle 1. As discussed, it was incredibly difficult to use either method to identify gaps across the whole cohort, particularly when taking into account the different settings involved.

This meant that we needed to go back to the drawing board in terms of choosing what "gaps" to fill. Cycle 1 had given us some broad areas so we chose the elements of those areas we considered most likely to be threshold concepts, which would inhibit understanding of further topics if the skills gaps remained.

We chose 8 different topics which covered: multiplying decimals, dividing decimals, rounding to significant figures, recognising prime numbers, expressing as a ratio, converting from a ratio to a fraction, finding missing parts in a ratio, and upper and lower bounds.

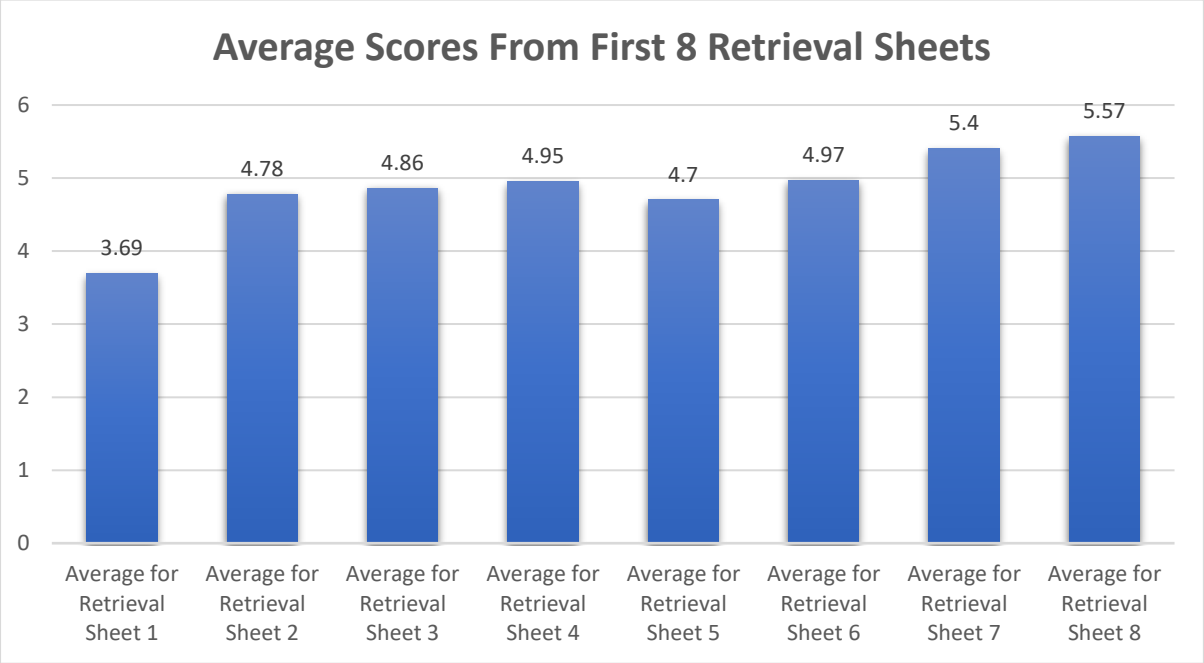
We then created a series of retrieval sheets to cover these 8 topics, to be completed every lesson over a series of 16 lessons. The retrieval sheets were designed in a way that we hoped would work on only the skill itself, stripping away any additional complexities found in exam questions. A tracker was created to monitor any improvements made.

These sheets were administered by all involved staff at the start of every lesson, with students performing corrections and completing the tracker. Staff were instructed to give further examples to students who failed at any of the questions and used their own judgement on how to improve understanding. Visual methods were employed, alongside setting of additional homeworks on www.mathswatch.co.uk and students used www.fliptmaths.co.uk for independent practice.

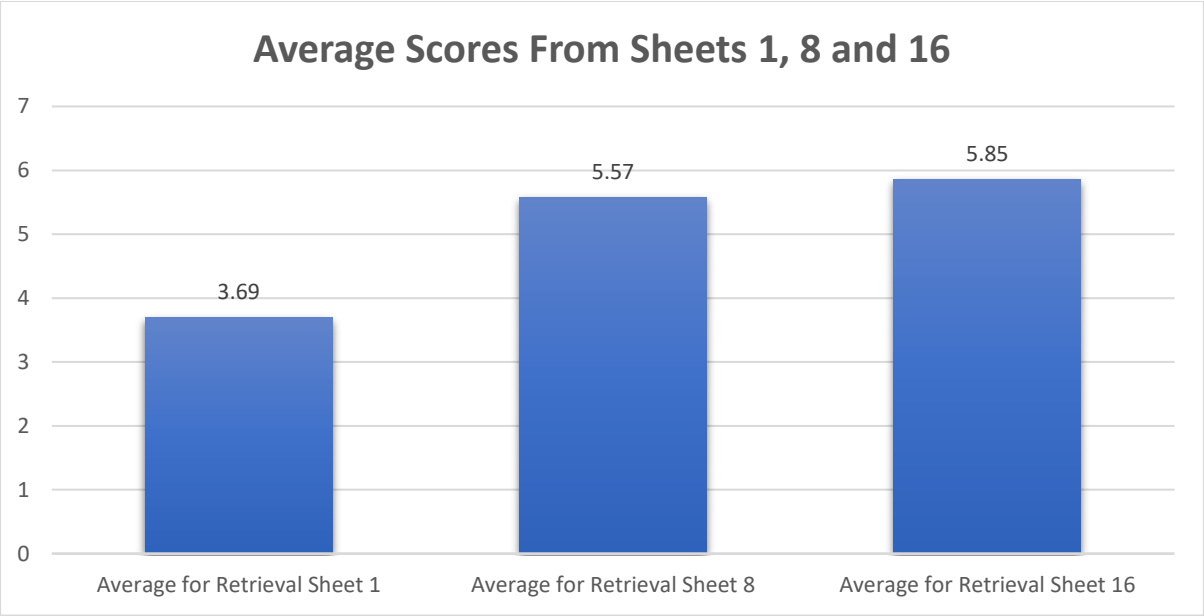
Staff and students were surveyed on their opinions of the efficacy and usability of the retrieval sheets as methods of gap filling. The students were surveyed at the mid-point of the intervention and staff were surveyed after the first two sheets and then again at the midpoint.

Cycle 2 - Results

The results from the students' scores on the retrieval sheets did show an initial improvement almost immediately, however after this point improvement slowed and began to plateau.



From the first sheet to the final sheet the average score for all students increased from 3.69 to 5.85 which shows significant improvement.



When we looked more closely at the trackers of individual students, we did find that individual skill improvements were varied. Students would often be able to answer a certain question correctly in one lesson and then fail to do so in the next lesson.

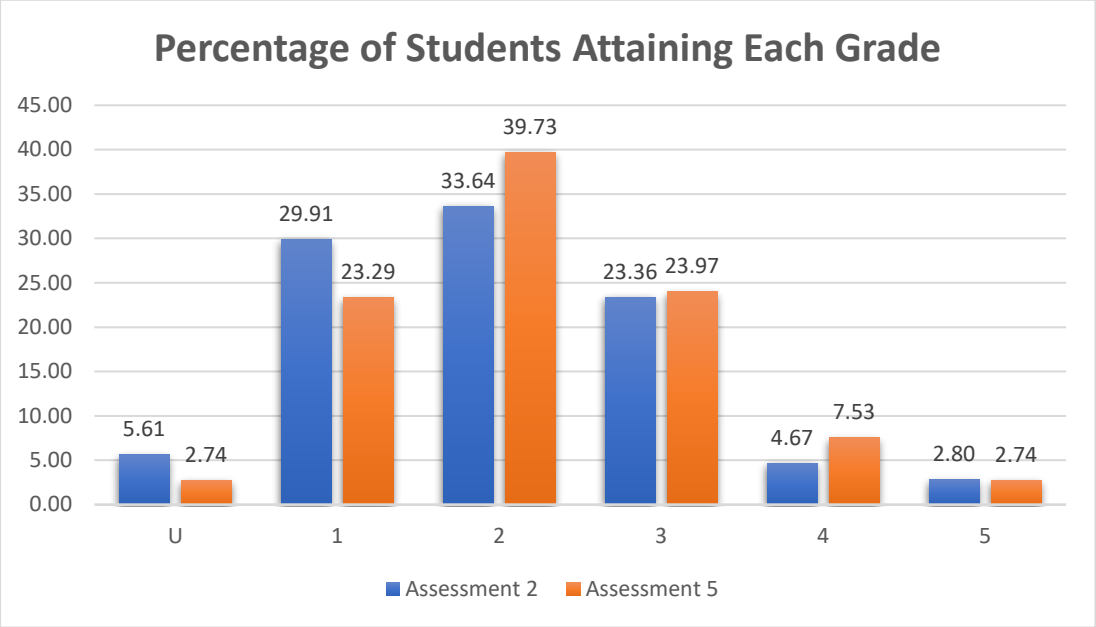
Teachers were initially positive about the intervention, commenting that “the task was easy to set, and didn't take a lot of time for the students to complete”, they noted the positive in class response from the students: “All students happy to engage with the task and comfortable with self-assessment sheets”.

At the mid-point of the intervention; after sheet 8; 77% of students who responded to the survey answered positively, with the biggest positive comments being; that they found the retrieval sheets helpful in improving their skills in the given topic areas and that they could see the progress that they were making through the use of the tracking sheets.

Criticisms of the sheets mainly focussed on the repetitive nature of the questions, and that some of the ratio questions were too wordy and they struggled with the comprehension element. Some students claimed the task was too easy, interestingly only one student who said it was too easy also claimed not to still need to work on any of the topics.

At the mid-point survey staff noted stark differences in response of their students to the intervention. Comments tended to agree that for some students the intervention appeared effective with students striving to improve their scores and consistently scoring highly by this point. However, most teachers noticed some students becoming disengaged from the process. Comments included “Many students are getting low scores every single time with very little progression and are happy to get the same questions wrong every time” and “some students … seem to have lost interest as time has gone and have not really tried with the later sheets”

When looking at the overall impact of the intervention we found that there was a slight improvement from Assessment 2 results, which was the last assessment before the intervention began and then the Assessment 5 results which was the final assessment of the year.



Conclusions and Recommendations

Conclusions

We found that using exam questions as a method of identifying skills gaps was almost impossible. The nature of many of the exam questions meant that it was very difficult to determine; from looking only at student responses; whether their inability to answer the question was due to a lack of aptitude in the associated skill, or whether it was due to failure to deduce what skills were required in answering the questions.

Using multiple choice, diagnostic style questioning through EEDI allowed us; in limited ways; to identify what responses were slips and where genuine misconceptions could be found. However, the method we used of choosing five of each topic made this largely unmanageable.

Retrieval sheets as a method of filling skills gaps was in large a success, particularly for topics such as Multiplying Decimals, expressing parts of a ratio as a Fraction and Rounding to Significant Figures. Dividing Decimals and Upper and Lower Bounds had a lower success rate.

Average scores on the retrieval sheets increased over time showing some element of gap filling was achieved. Overall improvement in Assessment Grades was too small to be definitively attributed to the intervention carried out.

Student response was mostly positive, however negative elements suggested the intervention was too repetitive and became too easy for some. Some staff echoed this, and their responses were mirrored by their students.

Recommendations

When attempting to identify skills gaps do not use past exam questions, there is too much to interfere with the result on each given question to identify a true skill gap. Diagnostic style multiple choice questions would be a much better option, although we would recommend keeping these brief to maintain focus.

Use of retrieval sheets is recommended and would be particularly useful if skills gaps are identified more appropriately. The issues we found were due to the amount of repetition so would recommend including less questions per sheet, and then running each sheet for 8 sessions rather than 16. Possibly cycling through the different skills after each set of sessions.

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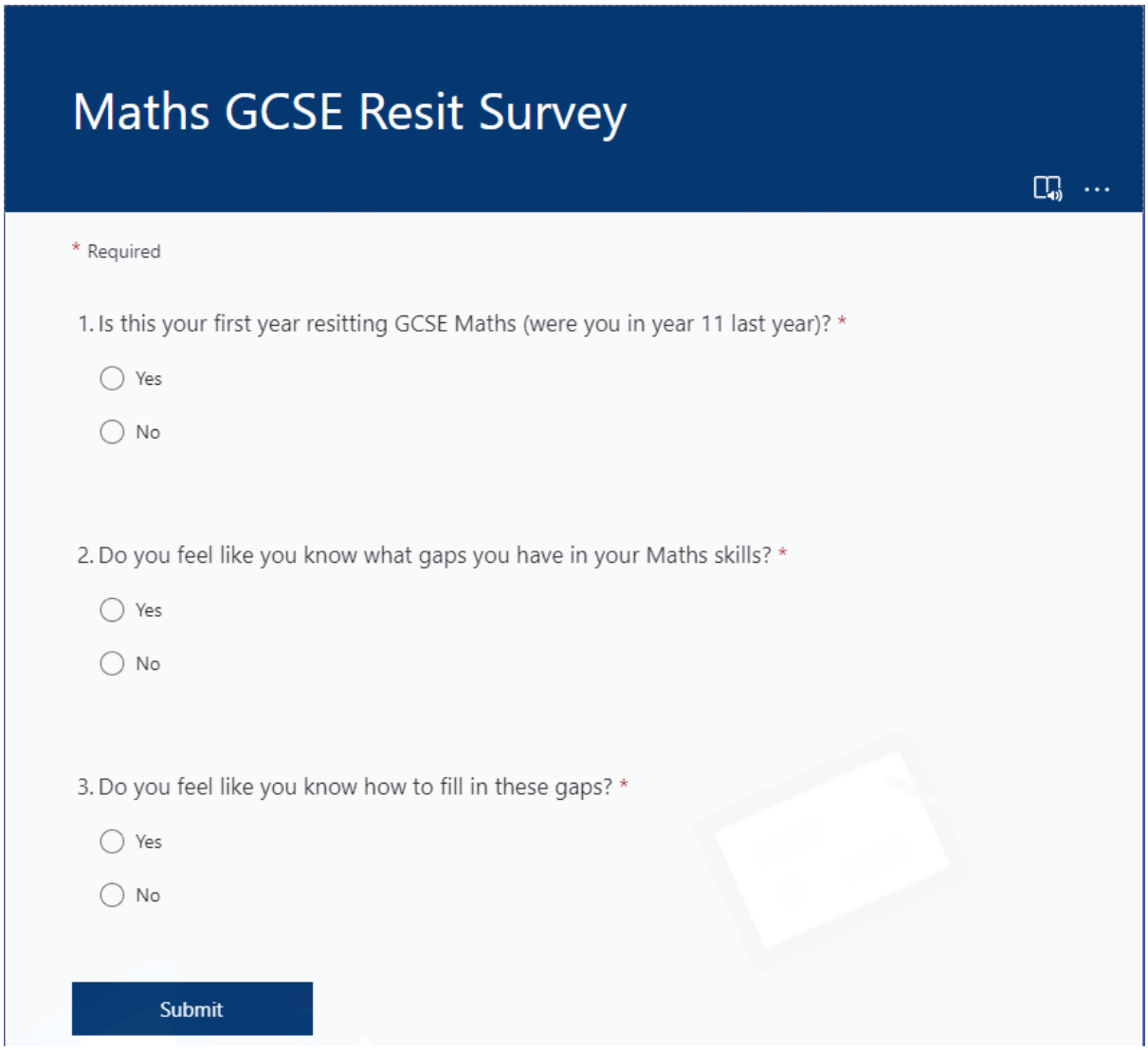
Appendices

Student Initial Survey



Assessment Question Analysis Spreadsheets

Initial Assessment Non-Calculator	Convert fraction to a percentage	Estimations (using area of circle)	Underestimate or overestimate	Product of Prime Factors	Increase by a percentage	Percentage of an amount	Evaluate powers	Multiply fractions	Subtract Fractions	Multiply Decimals	Round to decimal places	Money problem with fraction of amount	Money Calculation 4 operations	Proportion with weight	Ratio in simplest form	**Total**	**Percentage**
Question number	1	2a	2b	3	4	5	6	7a	7b	8	9	10	11	12	13		
Students/Marks Available	**1**	**4**	**1**	**2**	**2**	**2**	**1**	**1**	**2**	**3**	**1**	**4**	**3**	**4**	**2**	**33**	**100**
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Initial Assessment Calculator	Convert from standard form	Multiply in standard form	Bounds	Reverse percentages	Identify square number from a list	Identify common multiples from a list	Identify prime numbers from a list	Order numbers	Compare lengths	Round to significant figures	Compound Interest	Money Calculations - installments	Express as a ratio	Fraction of an amount inverse	Fractions of amounts with coins	Fraction, Percentage, ratio problem solving	Best Buy	Currency Conversions	Increase or decrease	Ratio and Fraction problem solving	Using a calculator	Create smallest number from digits	Fraction as a Ratio	Fraction of an Amount	Listing Outcomes/Permutations	Error Intervals	Ordering Fractions	**Total**	**Percentage**
Question number	1a	1b	2a	2b	3a	3b	3c	4a	4b	5	6	7	8	9	10	11	12	13a	13b	14	15	16	17a	17b	18	19	20		
Students/Marks Available	**1**	**2**	**2**	**2**	**1**	**1**	**1**	**1**	**1**	**1**	**3**	**2**	**3**	**2**	**4**	**5**	**4**	**5**	**1**	**5**	**2**	**2**	**1**	**2**	**2**	**2**	**2**	**60**	**100**
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Student Retrieval Sheet Tracker

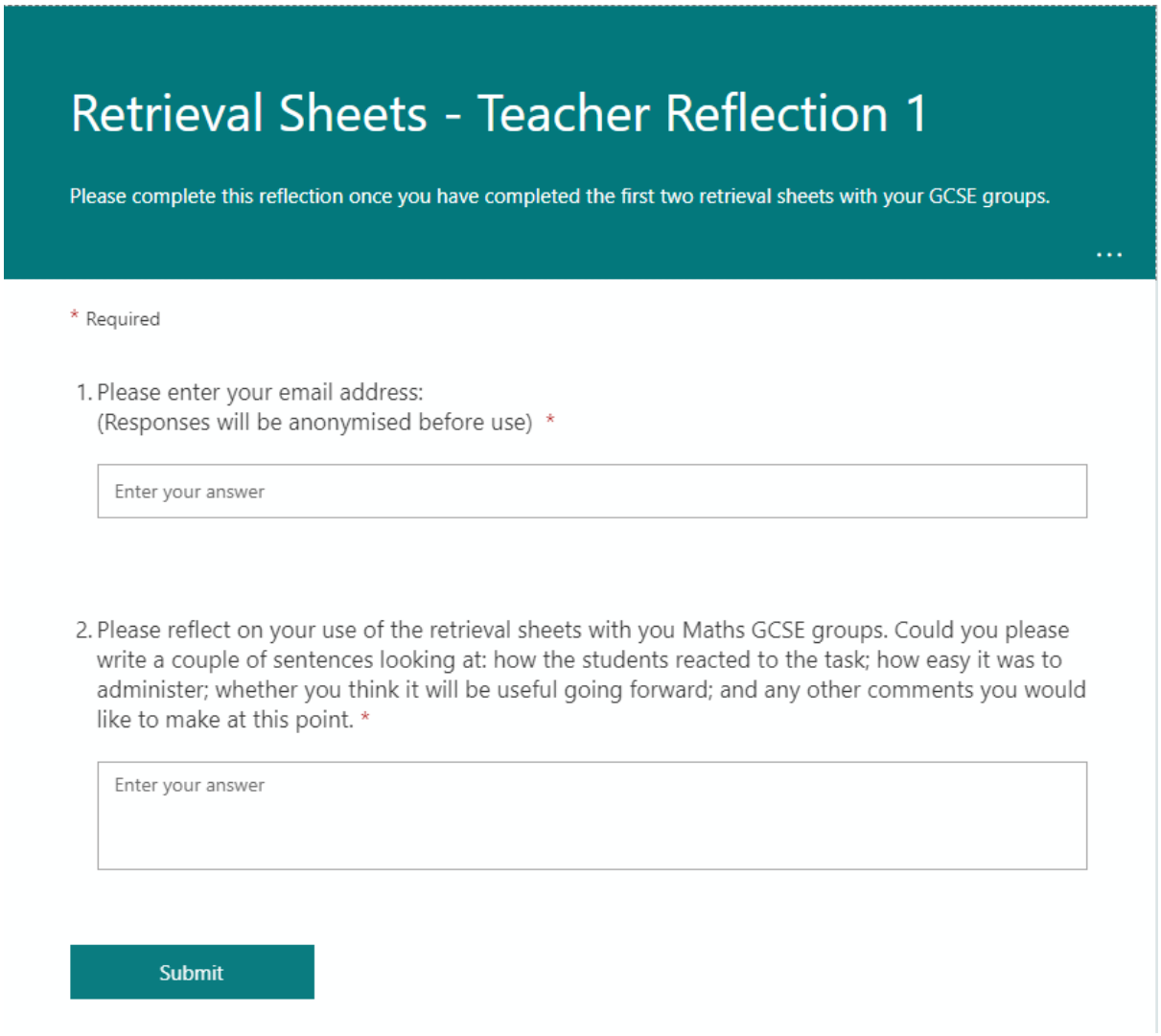
GCSE Maths Retrieval Skills Practice Tracker Put a tick for each question you got correct and then rate your confidence in this skill. 									
	Question 1	Question 2	Question 3	Question 4	Question 5	Question 6	Question 7	Question 8	Total Score
Sheet 1									/8
Sheet 2									/8
Sheet 3									/8
Sheet 4									/8
Sheet 5									/8
Sheet 6									/8
Sheet 7									/8
Sheet 8									/8
Sheet 9									/8
Sheet 10									/8
Sheet 11									/8
Sheet 12									/8
Sheet 13									/8
Sheet 14									/8
Sheet 15									/8
Sheet 16									/8

Presentation last modified: 18 July

Retrieval Sheet 1

GCSE Maths Retrieval Skills Practice 1			
1. 0.52 x 36	2. 3.5 ÷ 0.4	3. Round 0.01928 to 1 significant figure.	4. List all of the prime numbers less than 10.
5. Express in its simplest terms: 35:25	6. The ratio of red apples to green apples in a basket is 1:2. What fraction of the apples are red?	7. A drawer contains white socks and black socks only. The number of white socks to the number of black socks is in the ratio 1:3. There are 12 white socks, how many are black?	8. A wooden toy is 6 cm tall to the nearest cm. Find the shortest height the toy could be.

Teacher Reflection 1



Retrieval Sheets - Teacher Reflection 1

Please complete this reflection once you have completed the first two retrieval sheets with your GCSE groups.

...

* Required

1. Please enter your email address:
(Responses will be anonymised before use) *

Enter your answer

2. Please reflect on your use of the retrieval sheets with you Maths GCSE groups. Could you please write a couple of sentences looking at: how the students reacted to the task; how easy it was to administer; whether you think it will be useful going forward; and any other comments you would like to make at this point. *

Enter your answer

Submit

Student Feedback Survey

Student Feedback - Retrieval Sheets

We would appreciate it if you could give us some feedback on your experience of using the retrieval sheets in lessons.

1. What is your school or college *

- ◯ Wilberforce College
- ◯ Franklin College
- ◯ Hessle High School
- ◯ Sirius West

2. What Maths group are you in? *

- ◯ MA1G1A -
- ◯ MA1G1B -
- ◯ MA1G1C -
- ◯ MA1G1D -
- ◯ MA1G1E
- ◯ MA1G1F
- ◯ MA1G2A -
- ◯ MA1G2B
- ◯ MA1G2C
- ◯ MA1G2D
- ◯ MA1G2E
- ◯ MA1G2F
- ◯ MA1G3A
- ◯ MA1G3F -
- ◯ MA1G4F -

3. Please write a sentence or two on how you have found using these retrieval sheets in lessons. Eg, have you found them to be useful, is there anything you would like changing regarding how we use these sheets etc. *

4. Are there are topics that you feel you are still struggling with at this point? *

- [ ] Question 1 - Multiplying Decimals
- [ ] Question 2 - Dividing Decimals
- [ ] Question 3 - Rounding to Significant Figures
- [ ] Question 4 - Prime Numbers
- [ ] Question 5 - Simplifying Ratio
- [ ] Question 6 - Fractions from a Ratio
- [ ] Question 7 - Missing Parts in a Ratio
- [ ] Question 8 - Bounds and Error Intervals
- [ ] No longer struggling with any topic
- [ ] I could do all of the questions before we started doing the sheets.