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HOW DOES THE TONE OF ASSESSMENT FEEDBACK IMPACT THE MOTIVATION AND ENGAGEMENT OF BRITISH GCSE MATHEMATICS RESIT STUDENTS IN A FURTHER EDUCATION SETTING?

In this manuscript, we evaluate the efficacy of providing students with formative and summative assessment feedback of various tones. By contrasting student reactions to a variety of feedback, we aim to enlighten UK-based educators across the Further Education sector on the optimal approach to authoring assessment feedback to improve learners' engagement and conscientiousness. In a perpetually changing educational landscape, we were particularly interested in teachers' opinions of feedback and to assess whether attitudes are changing towards more traditional forms of feedback. When reading educational academic reports, one should note well that the outcomes of such research are seldom transferrable, but we hope that this report enables the reader to apply transferable techniques in order to better their provision of assessment feedback to the benefit of their learners.

CONTENTS

INTRODUCTION

The modus operandi of all educators should place compassion and empathy for the individual learner above all (Decety & Ickes, 2011; Goroshit & Hen, 2016). A prime opportunity for educators to express such empathy is through the provision of individualised feedback (Holmeier et al., 2018; Meyers et al., 2019; Warren, 2016). Warren discusses the application of empathy operationalised through perspective-taking, to benefit the quality of teaching internationally. Such a model is used to enable instructors to produce personalised feedback for the betterment of teacher-learner communication. Similarly, Meyers et al. define the notion of teacher empathy, arguing that individualised feedback with respect to individual students' socio-economic status enhances student learning. Holmeier et al. discuss the importance of individualised feedback as an aspect of successful formative assessment provision, analysing the quality of teacher feedback from a collated sample of completed feedback templates with the motivation of supporting the students in acquiring organisational competency.

Teacher attitudes toward, and utilisation of, summative and formative assessment has altered in recent years (Leslie & Mendick, 2015; Starr, 1970; Watt, 2005). Watt conducted a qualitative study into the methods of assessment used by 60 mathematics teachers from 11 secondary schools in Sydney, Australia. The author found that traditional assessment methods were deemed sufficient to assess student comprehension by more experienced teachers. Whereas, teachers of relative inexperience favoured more contemporary assessment techniques, of which were outlined by Clarke (1988) in Mathematics Curriculum and Teaching Program: Professional Development Package: Assessment Alternatives in Mathematics. Watt implied that traditional mathematics tests are inadequate in assessing student levels of higher-order cognitive processes. However, she noted that a major concern was that the learners' results from alternative assessment strategies may be misrepresented due to their perceived subjectivity. Starr administered a survey of 483 mathematics students and found that less than 2% of students favoured an evaluation method exclusively consisting of a final summative assessment interval. Though Starr's investigation was undertaken nearly two decades ago, it is clear to see that mathematics students valued regular formative assessment and is an inclination that is still observed in the educational zeitgeist of modern-day Britain (Chen et al., 2020; Ineson & Povey, 2020). Leslie and Mendick have documented extensively the change in questioning techniques as a form of formative assessment. They postulated that traditional closed questioning is proving to be unsuccessful in comparison to more modern assessment for learning questioning techniques, namely questions starting with 'Why do you think…?' are far more effective at assessing learner comprehension than 'What answer is in my head?' closed questioning techniques. Though questioning techniques are not the focus of this manuscript, one may find positive teacher attitudes towards effective questioning as a vector for formative assessment to be well documented (Peter, 2012; Stenmark, 1991).

Multivariate analysis has shown that students react differently to different styles of feedback (Brown & Kirschfield, 2007; Kyaruzi et al., 2019; van der Kleij, 2019). Kyaruzi et al.

surveyed 2767 Year 11 students and 60 Mathematics teachers from 48 secondary schools in Tanzania to investigate the impact of secondary school students' perceptions of teachers' formative assessment feedback delivery on student mathematics attainment. The authors found that students' attitudes towards feedback delivery positively predicted their performance in mathematics. Though this study illustrates the attitudes in Sub-Saharan Africa; and is as such a widely different context; one should acknowledge the highlighted benefits of outstanding feedback delivery by educators on student attainment. Brown and Hirschfield conducted a medium scale New Zealand-based quantitative study which found that Secondary Mathematics students with high-levels of self-regulation and motivation reacted positively to feedback which framed traditional summative assessments as formative assessments, due to the postulation that successful assessment feedback enables students to be accountable for their progress and become an active contributor to their own levels of attainment. Van der Kleij(2019) investigated the correlation between student perceptions of feedback and students' self-reported levels of self-efficacy, intrinsic values, and self-regulation. Interestingly, Van der Kleij's qualitative survey of 59 teachers and 186 students in secondary mathematics classes in five Australian schools found that feedback quality was perceived more positively by teachers than learners. The reader may infer from the aforementioned investigation that student characteristics are an intrinsic factor which influences student opinions of feedback. Thus, unbiased qualitative data is difficult to achieve in this field and any conclusions drawn should be understood with acknowledgement of uncontrollable influencing factors such as student values and local socio-economic status of the population. It is to this end that the decision was made to investigate how teacher feedback can influence the attentiveness of GCSE Mathematics resit students to the betterment of their engagement in Mathematics lessons.

MOTIVATION

The motivation behind this investigation is to improve mathematical attainment of GCSE resit students through the empowerment that positive teacher feedback may yield. Due to the atypical circumstances surrounding COVID-19, one cannot trust the GCSE Mathematics resit results of June 2020 to accurately illustrate the challenges that GCSE Mathematics resit examinees contend with. In June 2019, the average National pass rate examinees was 21.2%, decreasing by 1.4% since 2018 (JCQ, 2019). It should be noted well that 34.9% passed in the recent November 2020 resit opportunity (Parker, 2021), though the number of resit entries may have been influenced by the controversially awarded centre assessed grades of that summer.

It is as equally as important to discuss the local circumstances of this investigation as it is to portray the academic difficulties surrounding GCSE Mathematics resit attainment. The Centre of this investigation, Wilberforce Sixth Form College, is situated in Kingston Upon Hull - considered the 5th most deprived city in the United Kingdom for economic growth since 2009 (ONS, 2016). It should be acknowledged that 50% of the college's 2020 student cohort are in the highest band of deprivation, outlined by Her Majesty's Government. Hence, the deduction can be made that the socio-economic disadvantages facing our students contribute to the relatively low mathematical achievement of our students. This correlation has been well-documented globally (Sammons, 1995; Thomas et al., 1997; Tosto et al., 2016), possibly influenced by generations of hereditary apathy and a familial discouragement of offspring success (Heilman, 1929; Jerrim et al., 2015).

One cannot discuss the personal challenges of student cohorts in 2020 without acknowledging the destruction that the recently identified β-coronavirus has brought upon the educational sector. Notably, the lockdown measures imposed as a consequence of the COVID-19 pandemic have held students back academically and has universally damaged student confidence in mathematics (Burgess & Sievertsen, 2020). It must be noted well that the precise implications of the lockdown measures on student attainment have yet to wholly materialise. Moreover, the aforementioned socio-economic issues outlined in this manuscript are only exacerbated by the pandemic (Bai et al., 2020; Montacute, 2020). Montacute highlights the implications that the virus will have on the widening disparity between the educational success of disadvantaged students and that of their peers within the UK education system: The closing of which is a sought-after goal for many British education institutions (Carter-Wall & Whitfield, 2012; Knowles, 2017). Though not the focus of this report, the reader should be aware of the health implications of the virus on both students and staff which may have limited the quality of teaching provision over the past year (Aucejo et al., 2020;Hill & Fitzgerald, 2020). This encompasses the necessity for creative methods of encouraging student engagement and thus portrays the motivation for this investigation. The method of this investigation, and how this approach was undertaken, is to be discussed.

METHOD

The investigation seeks to secure methods in improving student engagement in those with typically low levels of trait conscientiousness (Precket et al., 2006; Swan & Phillips, 1998). The vectors for which this improvement in engagement may potentially occur are outlined below, as three major action points:

- Cutting assessment into smaller chunks to allow for demonstration of ability, with the potential to aid motivation.
- Making feedback more positive and making any "negatives" actionable, with the potential to aid motivation and engagement.
- Get students to identify the areas they need the most feedback on when completing an Assessment, with the potential of aiding engagement in their own learning.

Our intention was to ensure that a solid action research investigation was conducted throughout the 2020/21 academic year, guaranteeing that the aforementioned methods of potentially improving student engagement were appropriately evaluated. As such, in August of 2020, the entire GCSE Mathematics and Functional Skills Level 2 Schemes of Work were revamped to allow periods of assessment which were interspersed biweekly throughout our learning pathway for the GCSE specification. Herein, we shall collectively refer to these periods of assessments as 'Micro Assessments.'

Micro Assessments

The Micro Assessments were implemented for both the GCSE and Level 2 Functional Skills provision throughout the academic year to ensure that attainment was appropriately measured and tracked. An excerpt of the tracking sheet which was used is attached below.

Paper	First Attempt		Second Attempt		Third Attempt	
	%	Effort	%	Effort	%	Effort
Non – Calc (1)						
Calc (1)						
Non - Calc (2)						
Calc (2)						
Non – Calc (3)						
Calc (3)						
Non - Calc (4)						
Calc (4)						

Macro Assessments

As part of the investigation, we chose to implement assessments which enabled students to direct feedback, via the opportunity to state which questions of the test they required feedback on the most. The motivation for this was to encourage students to direct their own learning with the hope that such an exercise may improve student motivation. In this manuscript, we shall collectively refer to these assessments as 'Macro Assessments' for the GCSE facet of the investigation.

The front covers of the Macro Assessments were tailored to ensure that our criteria of investigation were satisfied: To action the use of wholly positive feedback and to allow students to direct their own feedback (Helme, 2001; Metallidou & Vlachou, 2007). It allows pace for students to inform educators on the two questions they require the greatest detail of feedback on, and allow them to comment on their effort. Below, is a copy of the front cover we used for Assessment 4 and Assessment 5.

GCSE

Student Name		Previous Assessments	
		Initial Assessment	
Minimum Target Grade (MTG)	Aspirational Target Grade (ATG)	Assessment 1	
		Assessment 2	
Teacher Comment:		Assessment 3	
		Assessment 4	
		Assessment 5	
		Comment on your effort....	
Areas for Development:		/10	
Please specify 2 questions you would like detailed feedback on, this will be given within the paper (these must be questioned you have attempted): ☐ ☐			

It should be noted well that the invigilators of the Macro Assessments were asked to read the following statement to ensure a high level of student participation and to encourage motivation:

15/03 09:52

As part of the Maths Departments work as a Maths Centre for Excellence we are looking at the types of feedback a student would find the most useful. We are particularly looking at whether or not a student would find it more useful if they were to themselves chose where they were given feedback.

With this in mind, when you have finished your paper today could your please specify on the front of the paper 2 questions **THAT YOU HAVE ATTEMPTED** that you would like to be given detailed feedback on.

Due to the government restrictions imposed as a result of COVID-19, we were unable to retrieve a broad range of feedback from the Macro Assessments. As such, student-focussed reflection of the assessments was limited.

Questionnaires & Reflective Journals

Throughout the investigation, we encouraged staff to write reflective journals about the process in order to identify the potential improvement in student engagement of their classes. These were actioned after every micro assessment and macro assessments. The results of which will be discussed in the next section. An excerpt of the reflective journal is shown below:

Teacher Reflective Journals – Research Point 2 (Actioning Feedback)

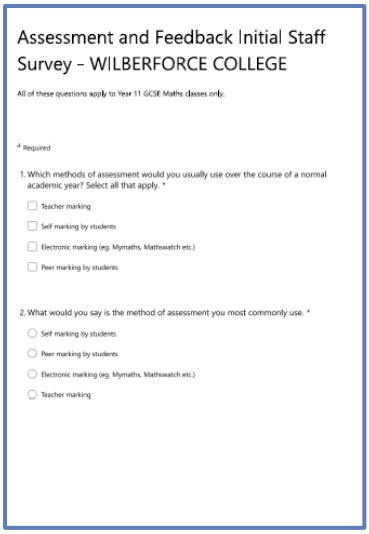
After repair has been completed by students based on your directed actioning for areas of improvement please could you complete this table. This only needs to be a couple of sentences describing how students engaged with your feedback, whether they completed the tasks you assigned them for development. Whether you feel it was a useful exercise for that particular group etc.

Please make a highlighted note if this group seemed unusual in their response compared to your other groups.

	Assessment 4	Assessment 5	Assessment 6
MA1G1B – ASD/SHS			
MA1G1C – ASD			
MA1G1D – ASD			
MA1G1E – SHS			
MA1G1F – LIR			
MA1G2B - LIR			
MA1G2C – MAW			
MA1G2D – MAW			
MA1G2E – ASD			
MA1G2F - ASD			

We also had staff, collectively with our CfEM partner institutions, conduct polls on what they thought about the impact of these micro and macro assessments and whether the staff perceive an improvement of student engagement dependent on different methods of

assessment marking and feedback delivery. In our pre-study questionnaires, we received 190 responses from students and 22 responses from staff.


Assessment and Feedback Initial Staff Survey – WILBERFORCE COLLEGE

All of these questions apply to Year 11 GCSE Maths classes only.

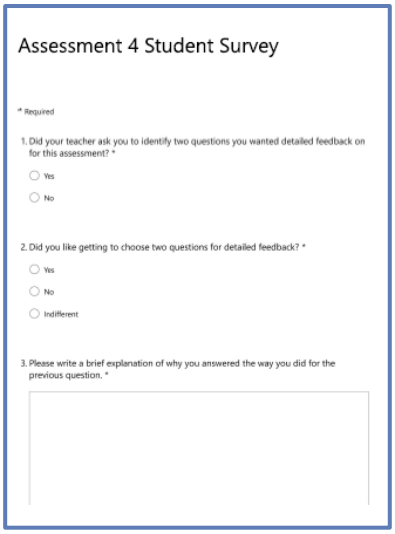
* Required

1. Which methods of assessment would you usually use over the course of a normal academic year? Select all that apply. *

- [ ] Teacher marking
- [ ] Self marking by students
- [ ] Electronic marking (eg. Mymaths, Mathswatch etc.)
- [ ] Peer marking by students

2. What would you say is the method of assessment you most commonly use. *

- ○ Self marking by students
- ○ Peer marking by students
- ○ Electronic marking (eg. Mymaths, Mathswatch etc.)
- ○ Teacher marking


Assessment 4 Student Survey

* Required

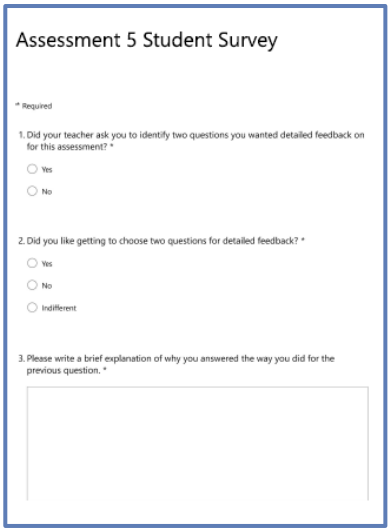
1. Did your teacher ask you to identify two questions you wanted detailed feedback on for this assessment? *

- ○ Yes
- ○ No

2. Did you like getting to choose two questions for detailed feedback? *

- ○ Yes
- ○ No
- ○ Indifferent

3. Please write a brief explanation of why you answered the way you did for the previous question. *


Assessment 5 Student Survey

* Required

1. Did your teacher ask you to identify two questions you wanted detailed feedback on for this assessment? *

- ○ Yes
- ○ No

2. Did you like getting to choose two questions for detailed feedback? *

- ○ Yes
- ○ No
- ○ Indifferent

3. Please write a brief explanation of why you answered the way you did for the previous question. *

COVID-19 restrictions have hindered the conduction of this investigation. It is our hope that this manuscript will provide a basis, and at least an inclination, of the strength of the suggested correlations.

RESULTS

The purpose of this investigation was to gain an insight into the perceptions of feedback delivery, both from a teacher and a student perspective. As a result, the majority of the data which is to be discussed will be qualitative. Though COVID-19 hindered the quality of this investigation, it is our hope that these findings provide a solid foundation for future investigations.

The first facet of this report to review would be the teacher and student opinions of the micro assessments. As a reminder, these assessments were administered throughout the year to track progress and attainment in both Level 2 qualifications.

Micro Assessments

As mentioned, the Micro Assessments were predominantly introduced to track student progress throughout the investigation. Due to the COVID-19 pandemic, we were unable to draw broad conclusions of the investigation using the quantitative data form the micro assessments. However, we were able to gauge student opinion of assessment provision.

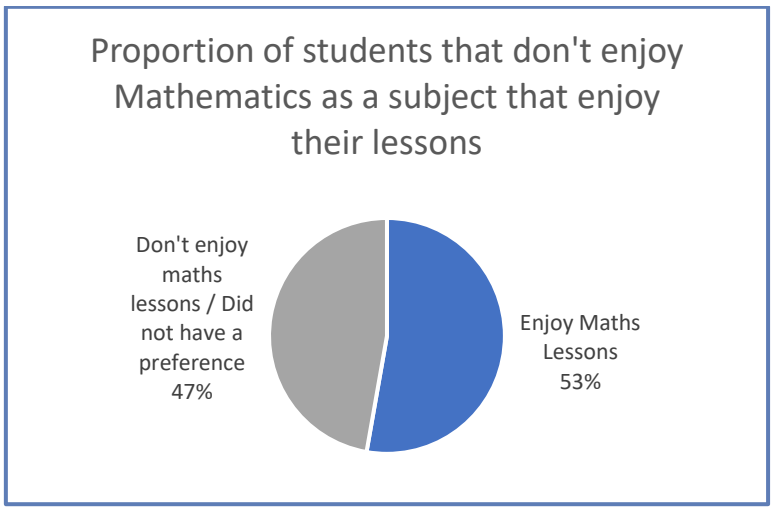
In order for the reader to have a full picture of the results of this investigation, we must illustrate a profile of the survey population. Namely, GCSE resit students who reside in a deprived city in North-East England. We sampled the opinions of 50 GCSE resit students at Wilberforce College on their thoughts towards the Micro Assessments and the quality of mathematics provision at the college.

The three-way table below shows the various questions we have asked, partitioned into their gender and opinion of mathematics. This was to enable the reader to see the impact of strong assessment provision on those who express a level of disdain for the subject. We shall discuss, in detail, the interpretations of the data gathered for each notable question.

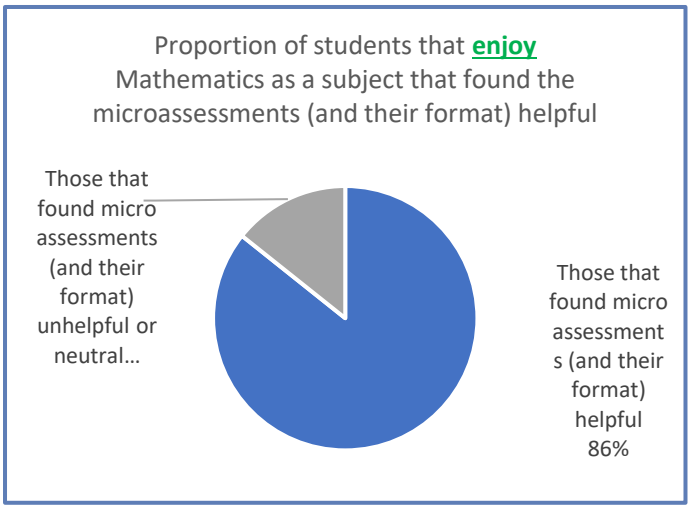
Preference of GCSE Mathematics Assessment Provision by Subject Interest and Gender						
Mathematical Interest				Gender		
				Male	Female	Total
From those that **enjoy** Mathematics	Found micro-assessments helpful	Yes	Count	3	9	12
			% within gender	75.0%	90.0%	85.7%
		No	Count	1	1	2
			% within gender	25.0%	10.0%	14.3%
		Total	Count	4	10	14
			% within gender	100.0%	100.0%	100.0%
	Prefer teacher marked assessments over student self-marked assessments	Yes	Count	4	10	14
			% within gender	100.0%	100.0%	100.0%
		No	Count	0	0	0
			% within gender	0.0%	0.0%	0.0%
		Total	Count	4	10	14
			% within gender	100.0%	100.0%	100.0%
	Enjoy maths lessons	Yes	Count	4	10	14
			% within gender	100.0%	100.0%	100.0%
		No	Count	0	0	0
			% within gender	0.0%	0.0%	0.0%
		Total	Count	4	10	14
			% within gender	100.0%	100.0%	100.0%
From those that **do not enjoy** Mathematics	Found micro-assessments helpful	Yes	Count	16	6	22
			% within gender	59.3%	66.7%	61.1%
		No	Count	11	3	14
			% within gender	40.7%	33.3%	38.9%
		Total	Count	27	9	36
			% within gender	100.0%	100.0%	100.0%
	Prefer teacher marked assessments over student self-marked assessments	Yes	Count	22	6	28
			% within gender	78.6%	75.0%	77.8%
		No	Count	6	2	8
			% within gender	21.4%	25.0%	22.2%
		Total	Count	28	8	36
			% within gender	100.0%	100.0%	100.0%
	Enjoy maths lessons	Yes	Count	11	8	19
			% within gender	40.7%	88.9%	52.8%
		No	Count	16	1	17
			% within gender	59.3%	11.1%	47.2%
		Total	Count	27	9	36
			% within gender	100.0%	100.0%	100.0%

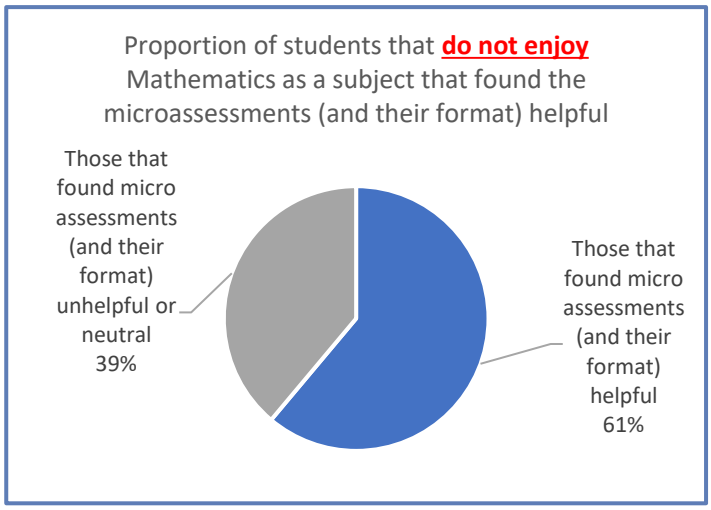
The first question was to ascertain student opinion of their maths lessons. We wanted to see whether some students' lack of motivation in mathematics was due to poor curriculum provision. Within the interest of the investigation, it was to ensure the ruling out of that potential controllable factor when deciphering the best method for promoting mathematical

confidence and academic success. Below, shows the fraction of low attainers that value their mathematics lessons.



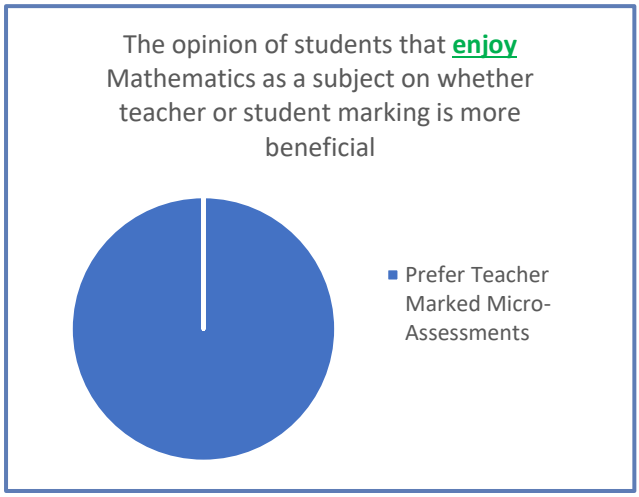
As mentioned, this initial question was to identify a potential controllable limiting factor on student success at the college. Most who were interviewed were positive in their view of maths provision. More specifically, 100% of the surveyed students that had a positive outlook on mathematics also shared that perception of their lessons. With that discussed, we shall now progress on to the analysis of whether the micro assessment provision was beneficial to the students.

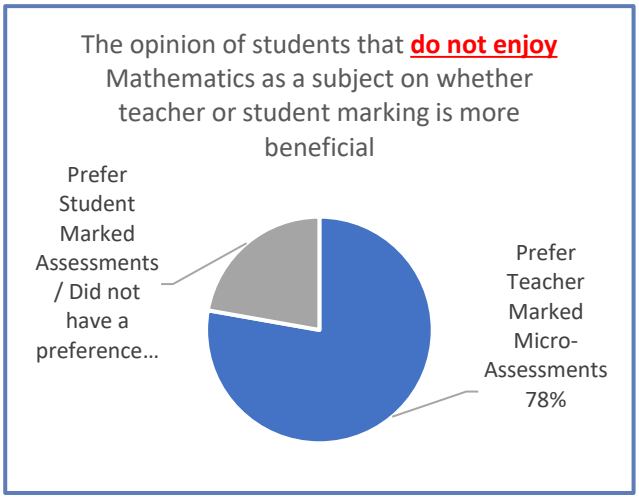




The pie charts show the opinion of the efficacy of the micro assessment provision separated into students who enjoy mathematics and those that do not. It is evident that students, irrespective of their opinion of the subject, perceive the benefit of regular formative assessment to ensure knowledge gaps are identified and potentially bridged. It is encouraging that students are being made aware of such benefits throughout their academic career, regardless of student conscientiousness or intelligence.

The next question we wished to investigate was the method in which feedback of the micro assessment was initiated: Should it revolve around student self-marking or traditional teacher graded feedback? The following charts express the samples' consensus on this matter sectioned into student opinion of mathematics in accordance with the previous





charts.

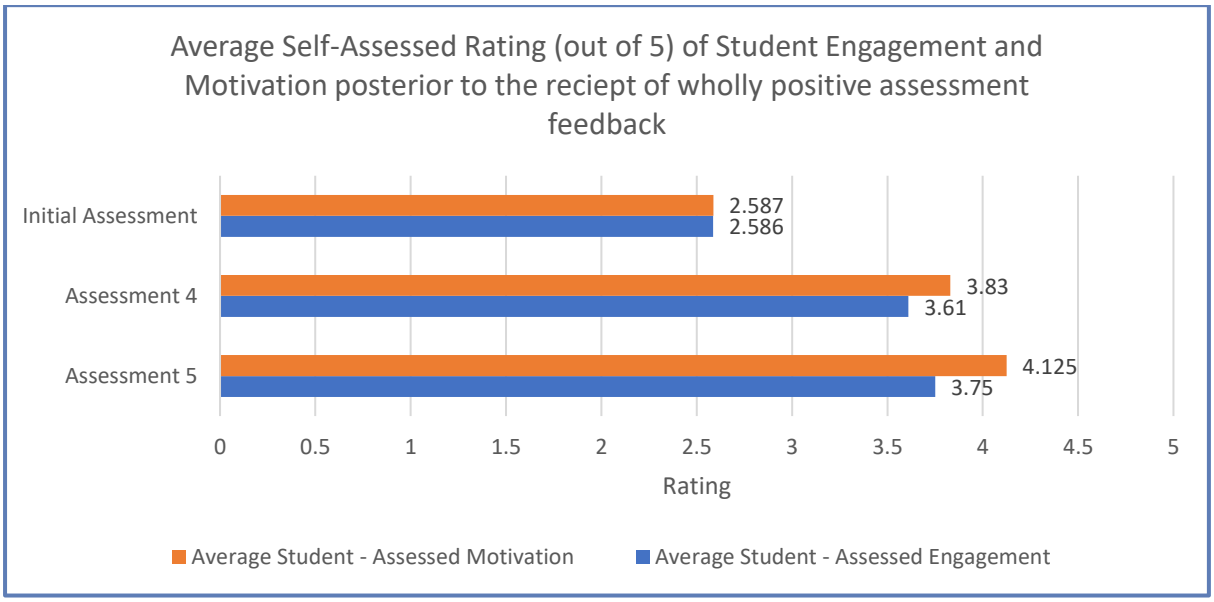
The most notable observation is that 86% of students prefer teacher marked assessments. In the raw data, one may observe that student opinion of teacher feedback is so that they are able to actively engage with the answers as teachers demonstrate the exemplar solutions to the class. This may be due to a reduction in cognitive overload: Instead of students stressing over marking questions in accordance with the mark scheme, they are able to focus on teacher reasoning and justification of each step within a model solution. Though the correlation between restricting student cognitive load and their comprehension of mathematical content is well-documented (Morrison & Anglin, 2005; Tarmizi & Bavat, 2012), this reasoning is purely speculation on our part.

We shall now discuss the student opinion of the macro assessments. As a reminder, these were the assessments that were administered so that students were able to direct their own feedback, by asking them which questions they specifically wanted feedback on. Parallel to this, all actioned teacher feedback from these macro assessments was to be wholly positive, with the aim of improving student motivation.

Macro Assessments

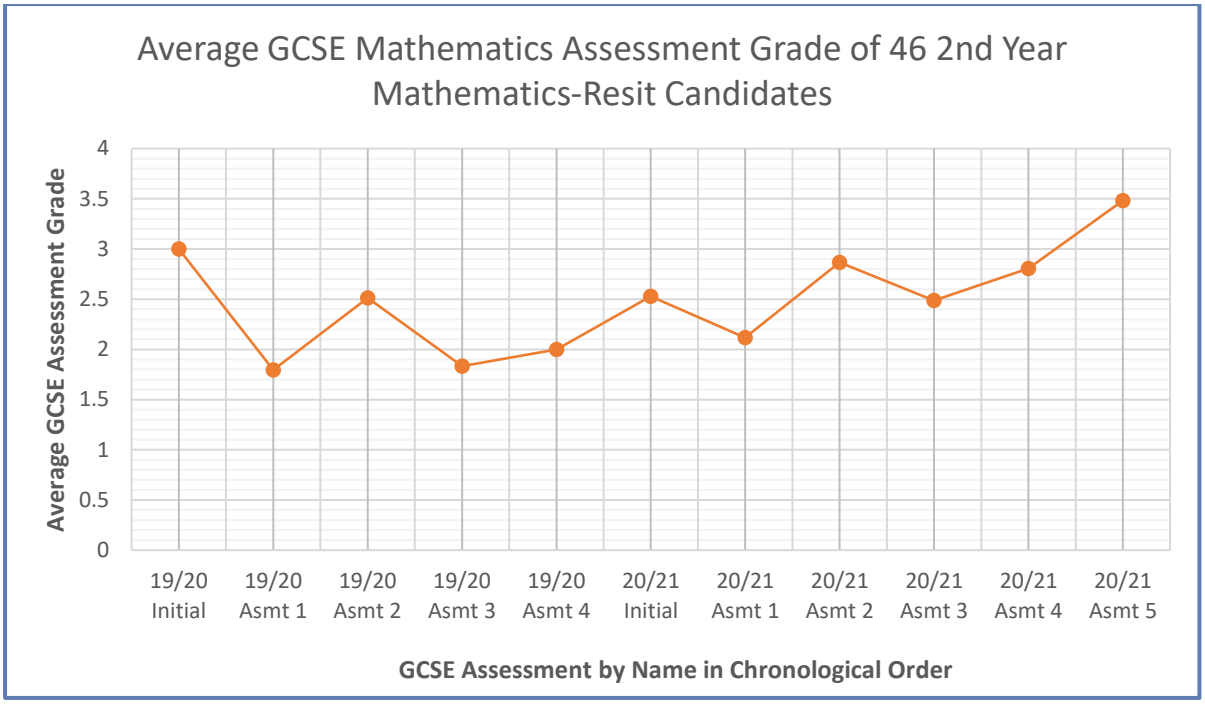
The decision was made to start implementing the Macro Assessments during Assessment 4 and to repeat for Assessment 5. Thus, our dataset for this strand of the analysis is narrow.

Irrespective of this fact, a surprising observation from student surveys is the change in motivation and engagement that the students felt during the investigation process. We asked the students to rate their own levels of engagement and motivation to pursue mathematical success after the provision of assessment feedback for the macro assessments, allowing the initial assessment to act as a baseline measurement.



From the above chart, one can observe that students' perception of their own engagement and motivation has improved over the three assessment windows. It should be noted that we did not start implementing the wholly positive feedback until Assessment 4 and Assessment 5. Thus, one may attribute this increase in student self-belief to the provision of wholly positive feedback, though of course a more comprehensive investigation is to be undertaken to determine whether any such stronger correlation is to be true.

It is evident that students' motivation in Mathematics – on average – has increased during the investigation. In order to evidence this, we shall now discuss the quantitative data from the Macro Assessments. The graph below shows the average scores of 46 2nd time Mathematics GCSE Resit students over the 2019-2020 and 2020-2021 academic years. It should be noted well that attainment is not necessarily a whole reflection of their motivation and engagement, though it may be seen as a predictor of such (Vidal Rodeiro, 2012).

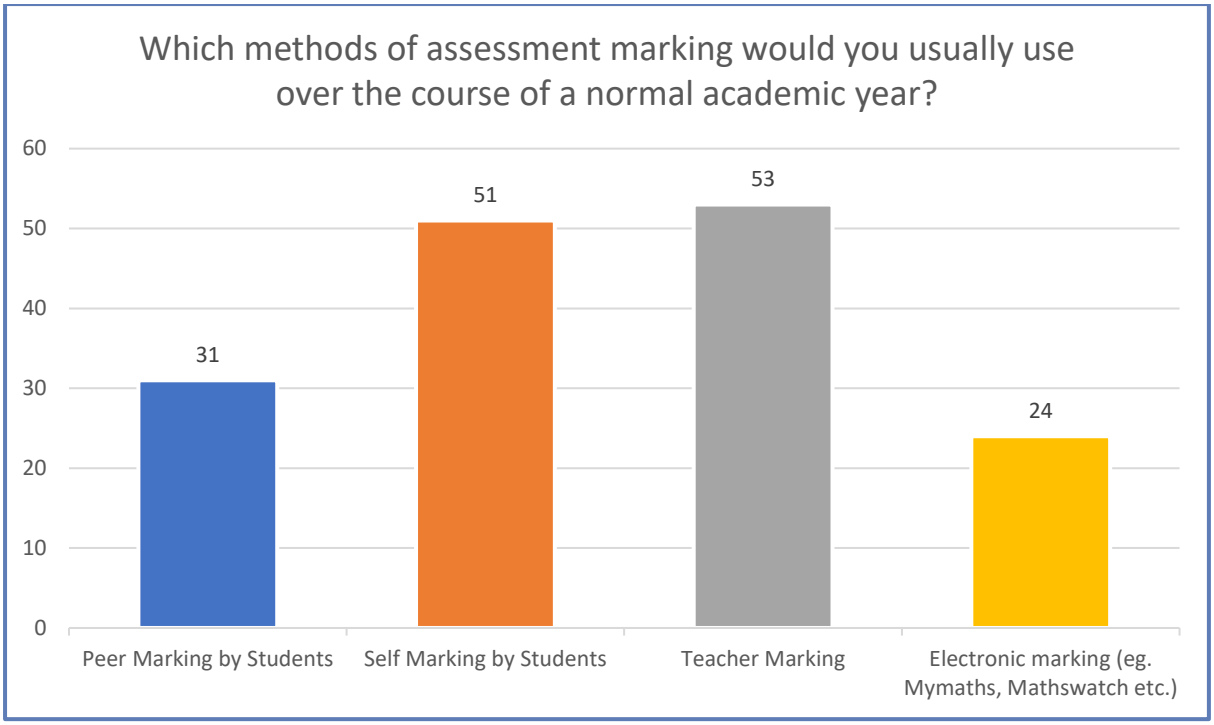


As a reminder, we began this year's investigation from Assessment 4 and Assessment 5 onwards, promoting the teachers' delivery of wholly positive feedback in order to aid student motivation and engagement. One should acknowledge that a positive trend occurs between the windows of Assessment 3 and Assessment 5. This may be attributed to the actionable, 'wholly positive' feedback which was implemented over Assessment 4 and Assessment 5 – though a broader and more in-depth investigation than this should be conducted to determine the strength of such a postulated correlation. The various troughs in attainment, namely at Assessment 3 of 2019/2020 and Assessment 3 of 2020/2021, may be attributed to the restrictions imposed as a result of COVID-19.

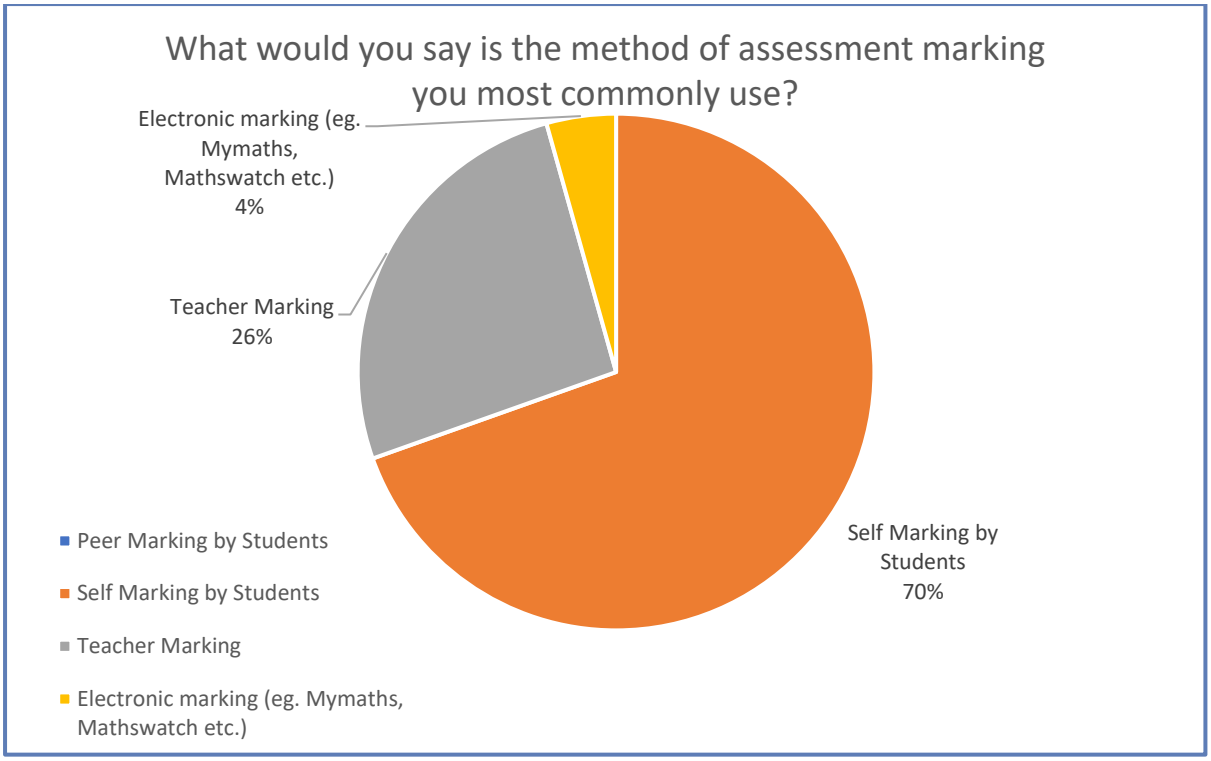
Questionnaires

Prior to the investigation taking place, we encouraged staff from the CfEM centre college and its partners to illustrate teacher opinion on the efficacy of various methods of assessment and feedback on student motivation and students' mathematical confidence.

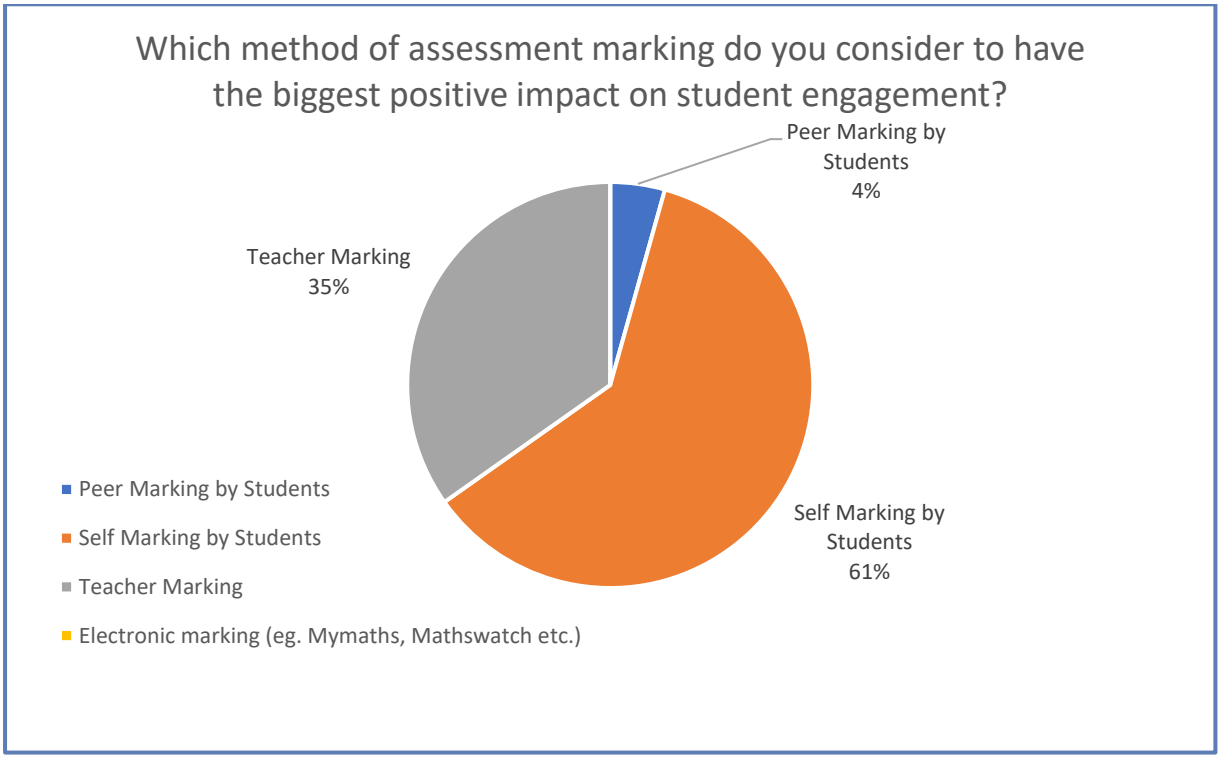
We initially asked 53 members of staff what methods of assessment they use in their teaching practice over a typical academic year, providing the options of 'Electronic Marking', 'Peer Marking by Students', 'Self Marking by Students', and 'Teacher Marking'.



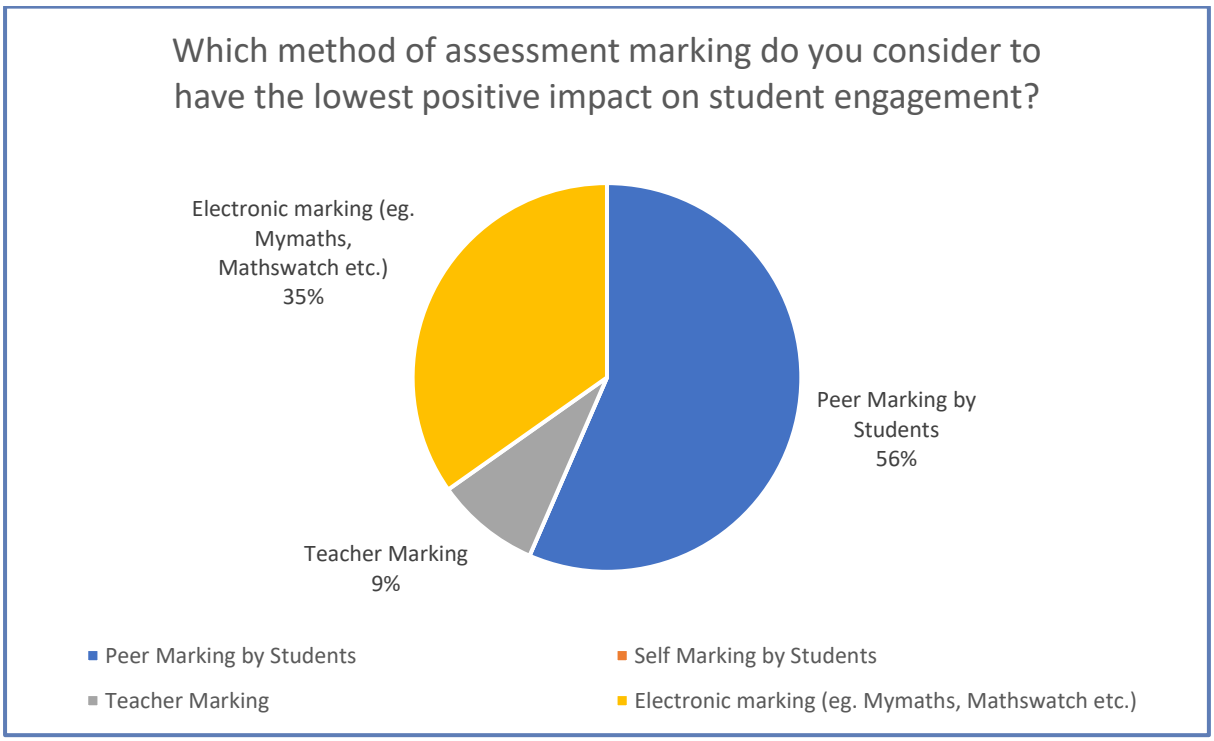
The educators in our partner schools use a multitude of methods of assessment. This has been documented to support mathematical attainment across different levels of study (Black & Atkin, 1996). In order to narrow the question down further, we subsequently asked what their preferred method of assessment is.



The most common medium of assessment is the encouragement of students to self-mark their work. A justification for this may be the ease of implementation for its relative effectiveness. This raises a potential question as to whether self-marking is a driver for student engagement since they are actively involved in the feedback process. This was an initial motivator for this current investigation and concurs with the data we gathered on the next question of the initial staff survey.



It is evident that the majority of partner staff agree that student self-marking has the greatest impact. One may postulate that this is due to the aforementioned active involvement by students or that students appear superficially involved as they mark their assessments themselves. It is undeterminable as to whether this perception of engagement is true engagement. In order to discover whether staff believe the engagement to be sincere, we asked which method brought about the least amount of engagement.

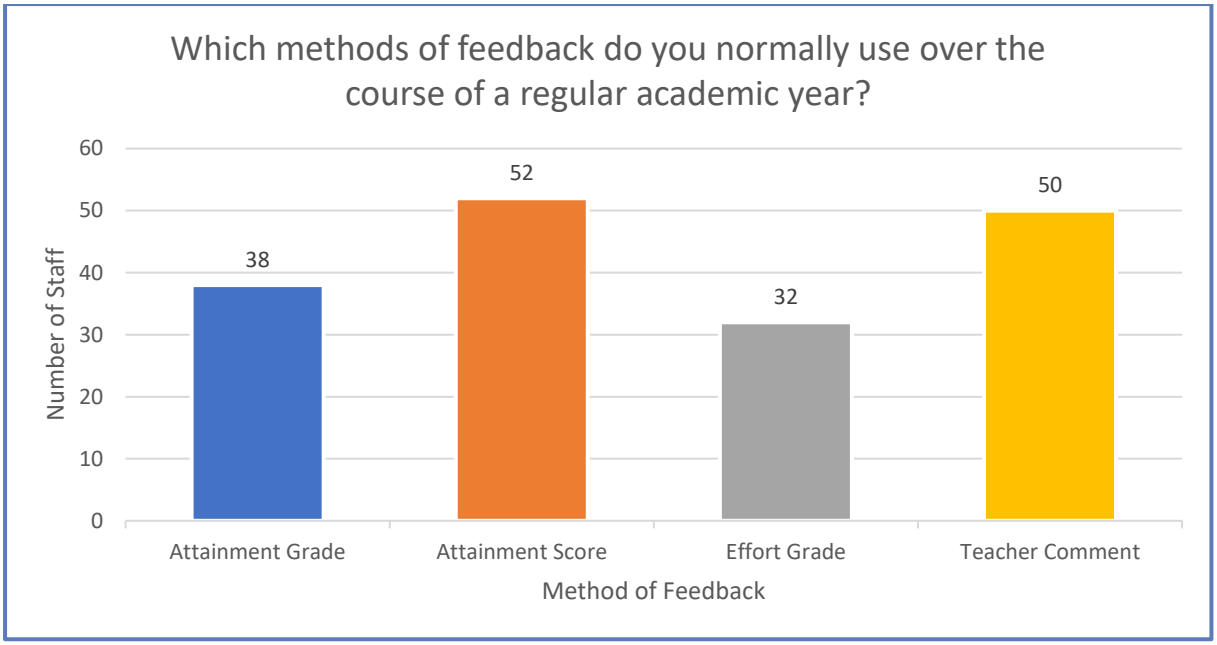


From the above chart, one can observe that our staff perceived peer marking to be the least engaging. This may be due to the lack of control students have of their own feedback and students may believe they are not being directed by an expert. This may be a possible avenue of investigation for future research.

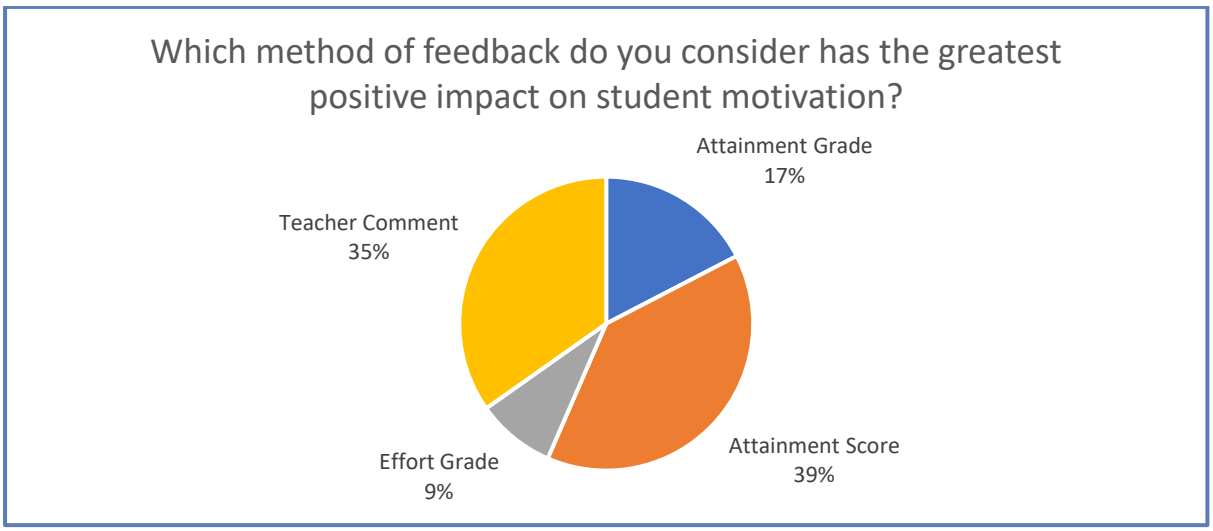
To briefly summarise, partner staff valued the utility and versatility that student self-assessment brings, perceiving results both from a student motivation and a student engagement perspective. The staff have expressed their view of the futility of implementing student peer-assessment top aid engagement in their lessons.

Thereupon, the same population - of 53 members of staff from all of our partner schools - was surveyed to assess their opinions of the influence that various methods of feedback implementation have on student engagement and motivation.

In parallel to the methods of assessment survey, we first investigated which methods of feedback teachers use throughout a typical academic year.

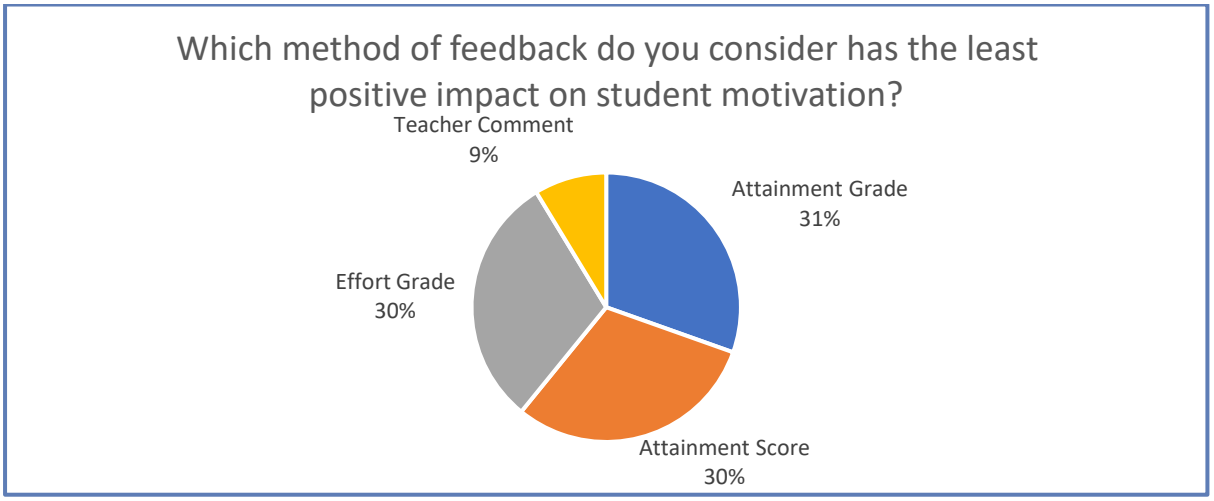


This shows that the most popular feedback media are attainment scores and teacher comment. Approximately 94% of our survey population regularly provide teacher comments as an approach to feedback. Hence, this provides a solid motivation to improve how feedback provision is implemented to the betterment of student engagement and conscientiousness. In order to assess whether our teaching staff believed this to be case, we subsequently surveyed the population on which they believe provides the greatest positive impact on student motivation.



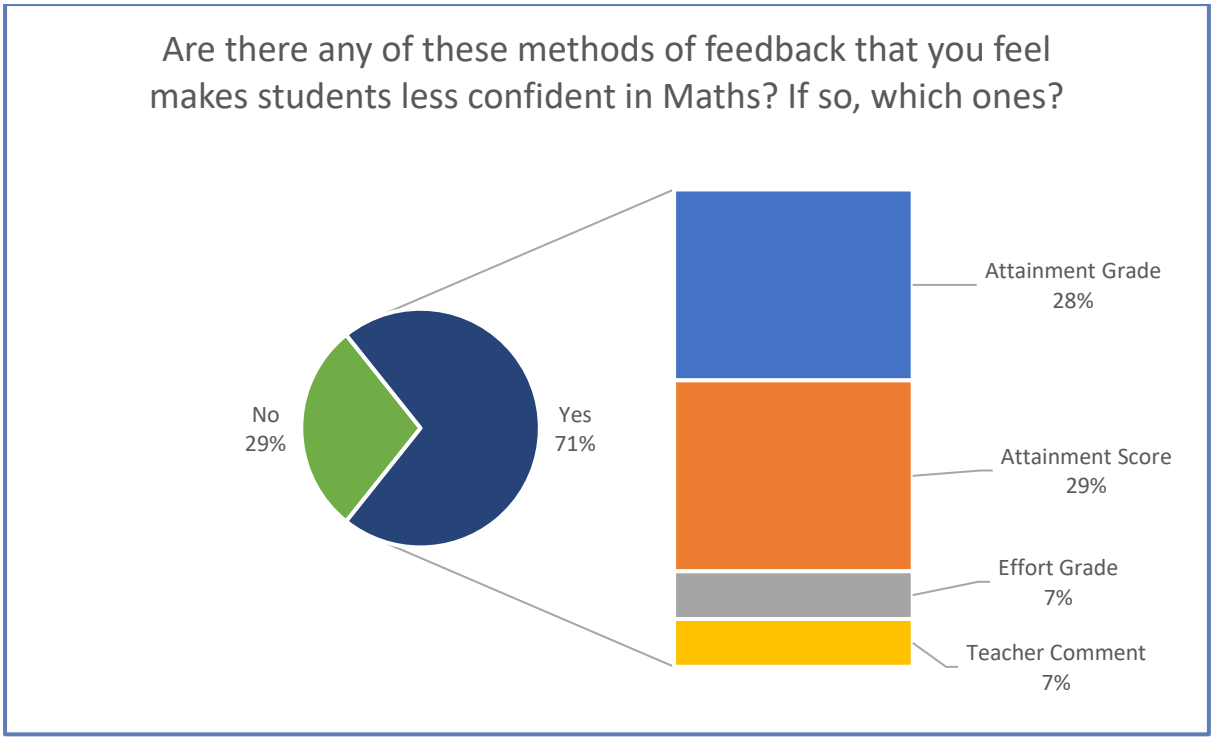
Our educators believe that attainment scores and teacher comments have the greatest impact on student motivation. There is evidence to suggest meaning-focussed feedback is paramount to establish a professional teacher-student relationship as a catalyst for the improvement of learner's motivation (Rakoczy et al., 2008).

To contrast this, we surveyed the population on which method of feedback they believed to be the least effective in aiding student motivation. The pie chart showing the percentage of opinion can be found below.



Interestingly, staff were divided on what the most futile method of promoting motivation is. Merely providing an attainment grade and an effort grade may not translate a method of improvement to a student. Often, effort grades are arbitrarily bounded and subjectively given. Thus, it has no transferable power when guiding the student on how to improve. An attainment grade, though robustly bounded, may not be impactful motivators for GCSE resit students as learners may become disengaged if they do not see the coveted Grade 4 marked on their assessment attempt (Anderson & Peart, 2016).

Subsequently, we surveyed the population on whether any methods of feedback are detrimental to student confidence. Below is the pie chart showing the percentage of staff that believe some methods of feedback are damaging to student confidence. Therein, each method of feedback that staff believe to be the most detrimental is highlighted in the proportion chart below.



The chart shows that the most detrimental methods of feedback are the explicit allocation of attainment grades and attainment scores, since 57% of our population collectively stated these methods in the survey. It is evident that the GCSE resit Mathematics teachers have observed a lack of confidence in their learners, upon their receipt of attainment grades and attainment scores. Though it is indubitably important that students know which grade they are working at, the approach by which this is delivered may mitigate the damage to learner confidence if more positive and actionable feedback can be implemented.

CONCLUSION

This investigation, though narrow in scope, hinted at correlations between the tone of assessment feedback and student motivation in mathematics. One can see that our evaluation into student self-assessed motivation and engagement, across the tenure of the assessments from the Initial Assessment of 2020/2021 to Assessment 5 of 2020/2021, has increased by 59.4% and 45.0% respectively. This may be attributed to the positive feedback that was penned by educators from Assessment 4 and Assessment 5. However, one should also acknowledge that student confidence in their studies is dependent on a multitude of variables the effects of which are only exacerbated by the COVID-19 pandemic.

Student voice concurred that the micro assessments were helpful, perhaps a corollary from this report is that regular assessment and feedback on such assessments are beneficial to student attainment and motivation. The data showed that, from those that either enjoy maths and from those that do not enjoy the subject, 86% and 61% of students respectively found the micro assessments helpful. It is also evident that, irrespective of their interest in Mathematics, the vast majority of students prefer their teacher to provide feedback rather than their peers.

From interviews of our CfEM partner staff, we found that most educators believed that self-marking by students was the method of assessment marking which has the greatest impact on student engagement. In contrast, the method with the least impact on engagement was forcing students to peer-mark their work. This may be due to the students not having a firm sense of direction on their own feedback provision. Staff were also asked to state their opinions on assessment feedback and how it is implemented. The majority of staff stated that either a teacher comment or an attainment score was most beneficial to student motivation and engagement. On the other hand, 29% of our population stated that an attainment grade was most detrimental to student motivation. One may question whether it is the approach with which the grade is provided which can alter students' perceptions of their own ability.

It is our hope that this investigation proves itself as a springboard for future investigations into the benefit of framing feedback positively to aid student engagement and motivation in GCSE Mathematics.

EVALUATION

It is without doubt that this investigation has been difficult to conduct. Engagement on the project was collectively difficult to retain throughout the academic year, resulting in a non-uniform amount of qualitative data from certain educators and their respective classes. This also influenced the amount of staff journal entries from the reflective journals, leading us to discard that facet of the investigation from further analysis.

The decision was made to action the 'wholly positive feedback' data collection from Assessment 4 of 2020/2021 onwards, leading us to only have the data for two Macro Assessments to discuss. On reflection, this decision limited the amount of data available. Therefore, this manuscript provides evidence toward the notion that an investigation benefits greatly when one considers the collection of data at the earliest opportunity rather than restrict it to a short timeframe.

Furthermore, the consequences of COVID-19 manifested themselves in the form of student apathy and academic disengagement during the second notable lockdown period imposed by Her Majesty's government. This, combined with the minimal amount of gathered data, has led to more uncontrollable variables influencing any correlation that was to be drawn in this manuscript.

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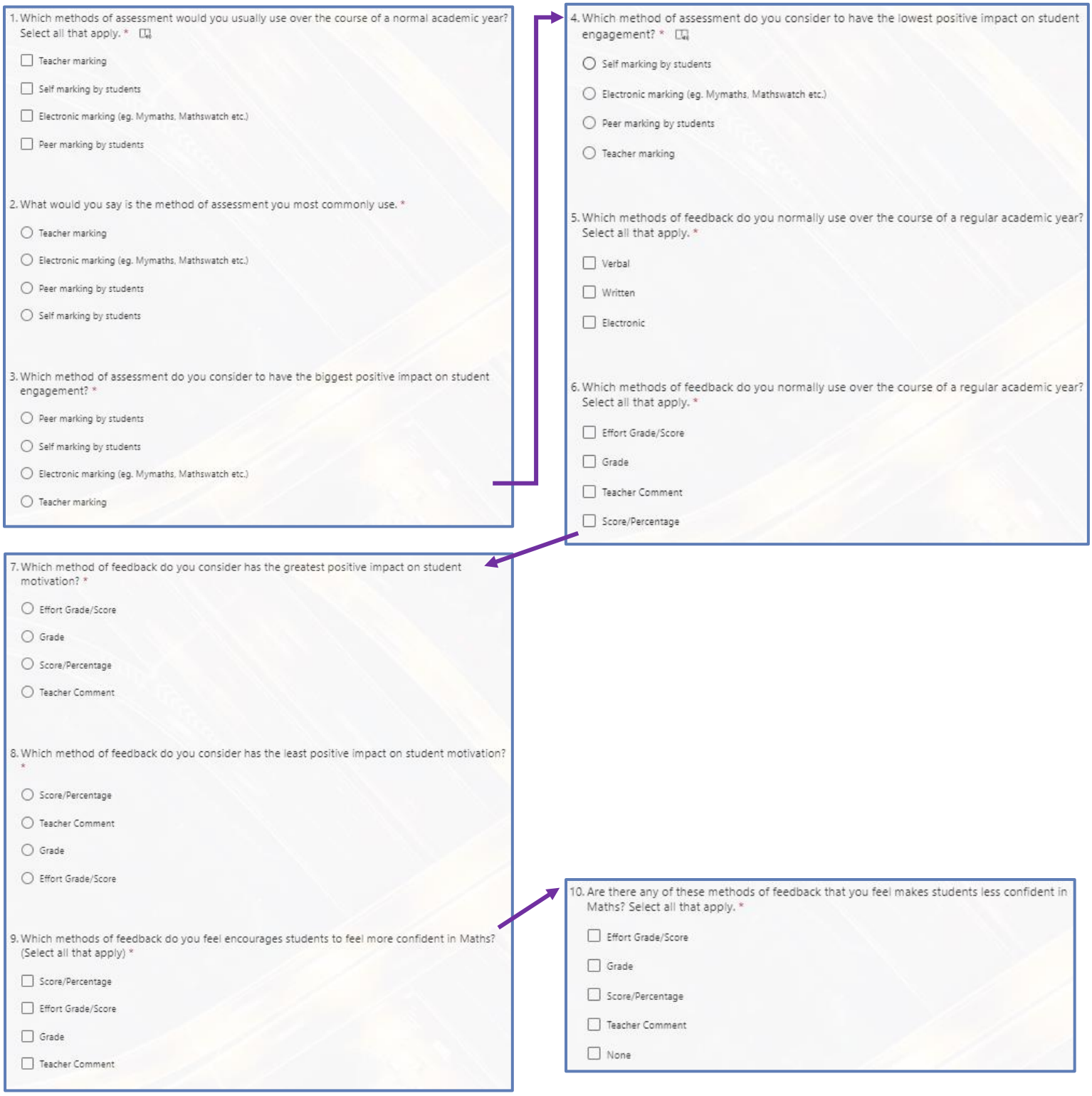
APPENDIX A: TEACHER QUESTIONNAIRES

Assessmentr & Feedback Initial Teacher Questionnaire



1. Which methods of assessment would you usually use over the course of a normal academic year? Select all that apply. *
- [ ] Teacher marking
- [ ] Self marking by students
- [ ] Electronic marking (eg. Mymaths, Mathswatch etc.)
- [ ] Peer marking by students

2. What would you say is the method of assessment you most commonly use. *
- ○ Teacher marking
- ○ Electronic marking (eg. Mymaths, Mathswatch etc.)
- ○ Peer marking by students
- ○ Self marking by students

3. Which method of assessment do you consider to have the biggest positive impact on student engagement? *
- ○ Peer marking by students
- ○ Self marking by students
- ○ Electronic marking (eg. Mymaths, Mathswatch etc.)
- ○ Teacher marking

4. Which method of assessment do you consider to have the lowest positive impact on student engagement? *
- ○ Self marking by students
- ○ Electronic marking (eg. Mymaths, Mathswatch etc.)
- ○ Peer marking by students
- ○ Teacher marking

5. Which methods of feedback do you normally use over the course of a regular academic year? Select all that apply. *
- [ ] Verbal
- [ ] Written
- [ ] Electronic

6. Which methods of feedback do you normally use over the course of a regular academic year? Select all that apply. *
- [ ] Effort Grade/Score
- [ ] Grade
- [ ] Teacher Comment
- [ ] Score/Percentage

7. Which method of feedback do you consider has the greatest positive impact on student motivation? *
- ○ Effort Grade/Score
- ○ Grade
- ○ Score/Percentage
- ○ Teacher Comment

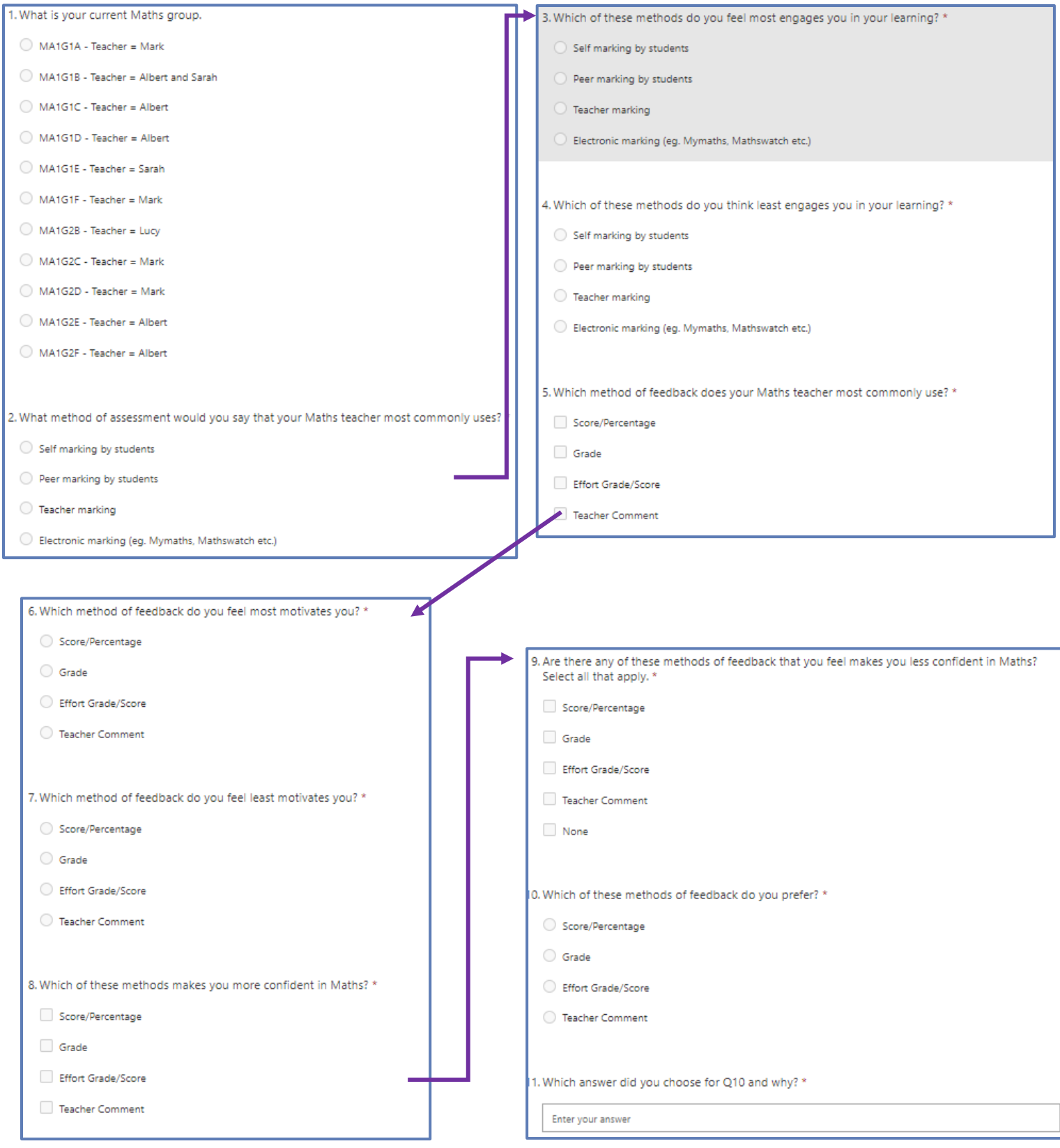
8. Which method of feedback do you consider has the least positive impact on student motivation? *
- ○ Score/Percentage
- ○ Teacher Comment
- ○ Grade
- ○ Effort Grade/Score

9. Which methods of feedback do you feel encourages students to feel more confident in Maths? (Select all that apply) *
- [ ] Score/Percentage
- [ ] Effort Grade/Score
- [ ] Grade
- [ ] Teacher Comment

10. Are there any of these methods of feedback that you feel makes students less confident in Maths? Select all that apply. *
- [ ] Effort Grade/Score
- [ ] Grade
- [ ] Score/Percentage
- [ ] Teacher Comment
- [ ] None

APPENDIX B: STUDENT QUESTIONNAIRES

Initial Student Questionnaire



Assessment 4 Student Questionnaire

1. Did your teacher ask you to identify two questions you wanted detailed feedback on for this assessment? *
   - Yes
   - No
2. Did you like getting to choose two questions for detailed feedback? *
   - Yes
   - No
   - Indifferent
3. Please write a brief explanation of why you answered the way you did for the previous question. *
   - Enter your answer
4. Did you find the detailed feedback on these questions to be useful? *
   - Yes
   - No
5. Please explain your answer to the previous question. *
   - Enter your answer
6. Do you feel that being given the option to ask for specific feedback made you more engaged when receiving feedback? *
   - Yes
   - No
7. Was the tone of your teachers comment more or less positive than previous assessments? *
   - More positive
   - Less positive
   - About the same
8. What impact did this have on your motivation to improve? *
   - More motivated
   - Less motivated
   - About the same
9. Did your teacher give you some steps on how to improve based on this assessment? *
   - Yes
   - No
10. Did you complete the actions your teacher suggested? *
    - Yes
    - No
11. Did this make you feel more or less engaged with your learning? *
    - More engaged
    - Less engaged
    - About the same
12. Now that you have received feedback on this assessment how would you rate your engagement with Maths resit in general? *
    - ☆ ☆ ☆ ☆ ☆
13. Now that you have received feedback on this assessment how would you rate your motivation to improve in Maths resit in general? *
    - ☆ ☆ ☆ ☆ ☆

Assessment 5 Student Questionnaire

1. Did your teacher ask you to identify two questions you wanted detailed feedback on for this assessment? *
   - Yes
   - No

2. Did you like getting to choose two questions for detailed feedback? *
   - Yes
   - No
   - Indifferent

3. Please write a brief explanation of why you answered the way you did for the previous question. *
   - Enter your answer

4. Did you find the detailed feedback on these questions to be useful? *
   - Yes
   - No

5. Please explain your answer to the previous question. *
   - Enter your answer

6. Do you feel that being given the option to ask for specific feedback made you more engaged when receiving feedback? *
   - Yes
   - No

7. Was the tone of your teachers comment more or less positive than previous assessments? *
   - More positive
   - Less positive
   - About the same

8. What impact did this have on your motivation to improve? *
   - More motivated
   - Less motivated
   - About the same

9. Did your teacher give you some steps on how to improve based on this assessment? *
   - Yes
   - No

10. Did you complete the actions your teacher suggested? *
    - Yes
    - No

11. Did this make you feel more or less engaged with your learning? *
    - More engaged
    - Less engaged
    - About the same

12. Now that you have received feedback on this assessment how would you rate your engagement with Maths resit in general? *
    - ☆ ☆ ☆ ☆ ☆

13. Now that you have received feedback on this assessment how would you rate your motivation to improve in Maths resit in general? *
    - ☆ ☆ ☆ ☆ ☆

Micro Assessment Student Questionnaire

1. Did this micro-assessment based on recent topics make you feel more or less confident with Maths *

- ○ More confident
- ○ Less confident
- ○ About the same

2. Did you find the micro-assessment more or less engaging than completing a longer formal assessment? *

- ○ More engaging
- ○ Less engaging
- ○ About the same

3. Did this micro-assessment make you more or less motivated towards your studies for Maths GCSE resit? *

- ○ More
- ○ Less
- ○ About the same

4. Please give one comment on your opinion on using micro-assessments in Maths resit. *

Enter your answer

APPENDIX C: MICRO ASSESSMENT QUALITATIVE DATA EXCERPT

Below, is an excerpt of the Micro Assessment qualitative data spreasheet, where we have colour-coded responses to reflect **positive**, **negative**, or **neutral** responses to the questions displayed in their respective columns.

STUDENT	Gender	How do you feel about Maths?	Do you want to achieve your GCSE?	Do you enjoy your Maths Lessons?	Do you find sitting a 'Micro-Assessment' useful?	How do you prefer the 'Micro-Assessments' to be marked? (Teacher/Self)
1	F	Maths is alright	Yes I need it for the future	Yes	Sometimes	Teacher
2	F	I feel good about it	Yes	Yes	Yes	Teacher
3	F	I want it to die	Well obviously I do but everytime I sit the exam I am a couple of marked off	I don't mind the lessons cos its a laugh	They annoy me cos I find them easy but still cant pass	Teacher marked cos I cant be bothered
4	F	Yeah I like it	Yes	yes	It allows me to see where Im at	Teacher marked
5	F	I struggle a lot with it I wish I didn't have to resit	Yes	I like that you've shown me how to do a lot of things in maths	The assessments are too often for me - stresses me out a little.	I prefer you marking them
6	M	I enjoy it when it's easy	Yes	Yes	I like to see what I don't know	Teacher
7	M	No point in it	I'm not fussed	I don't really see the point in going	no opinion	Teacher
8	M	I don't like it	Yes	No	I find them difficult	I prefer the teacher to mark them
9	F	I liked it more than I did before.	I'm more hopeful than I was before	My confidence is improving this year so yes. I wouldn't have said that last year	They have improved my confidence a fair bit	Self-mark so I can see where I've gone wrong more clearly
10	M	Wish I didn't have to do it	yes	Don't see the point	Dont see the point	Teacher
11	M	I hate it	Not fussed	No	Why do we have to do them?	Teacher
12	M	It's okay if I get it	yeah	Sometimes - depends on my mood	Useful	Teacher
13	M	It's okay	yes	When I find it easy yes	Useful	Teacher
14	M	I don't like it	yes	No	They are difficult and I don't see the point	Teacher
15	M	Yeah I enjoy it!	yes	Yeah	They are helpful so I can see what I need help with	Teacher
16	M	It's alright I guess	yes	They're okay	They're okay	Teacher
17	M	Maths is something ive always struggled with	yes	Absolutely	Useful	Teacher
18	F	I enjoy learning it	yes	Yes	Useful	Teacher