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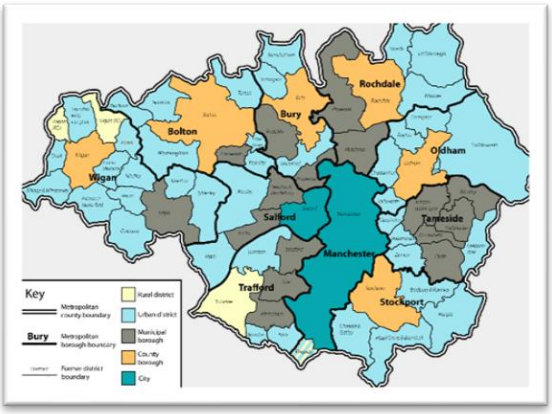

Clarendon Sixth Form College

HOPWOOD HALL COLLEGE

TRAFFORD COLLEGE

Target Setting – How can it be made effective for both students and teachers?

OUR PARTNERS

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About CfEM

Centres for Excellence in Maths (CfEM) is a five-year national improvement programme aimed at delivering sustained improvements in maths outcomes for 16–19-year-olds, up to Level 2, in post-16 settings.

Funded by the Department for Education and delivered by the Education and Training Foundation, the programme is exploring what works for teachers and students, embedding related CPD and good practice, and building networks of maths professionals in colleges.

Summary

This report begins by examining theoretical perspectives from current literature to analyse the current thinking on target setting and how this relates to making targets effective for both teachers and students.

This report describes our results from an initial student survey (370), followed by two action research cycles (18 students & 45 students) and a pilot (8 students). We have three colleges involved (Tameside College, Trafford College and Hopwood Hall) from the Greater Manchester area and six maths teachers.

We looked at three main questions, how students feel about targets generally especially following the impact of the last two years, how the format by which a target is set impacts upon the student and what resources can be used by the teacher in order to target students' ability to apply their mathematical knowledge.

We gathered information using a mixture of data collection techniques including online surveys, student interviews, teacher reflections and group discussions. The information was then analysed in order to identify recurring themes.

Our results and conclusions have identified the importance of targets that are classroom based, involve mathematical discussions with both peers and the teacher and allow time for repeated practice.

Contents

Background

Introduction

The college leading this project, Tameside College is situated in the East of Greater Manchester. From the 141 areas in Tameside, eight of these fall within the most deprived 5% nationally and a further 16 fall within the most deprived 10% nationally. In total, 13.4% of Tameside residents live in income deprived households with a 4.7% unemployment rate and around 9,000 children across Tameside are eligible for income based free school meals (Tameside Council 2022). Tameside College is one of the 21 colleges across the country to carry out Action Research as part of the CfEM programme and is working with others within its network to expand upon that research.

In order to best understand and therefore inform and narrow the focus of the research proposal, it is necessary to examine and evaluate the changing landscape and challenges faced in teaching a maths resit within FE. Traditionally maths teachers within FE face the cognitive dissonance between covering the maths content and taking the time to develop understanding (Swan, 2006). This discord has become even more pronounced since the advent of the reformed 9-1 GCSE examinations where the increased subject content directly contradicts the published criteria i.e. to not overload the syllabus (Roy, 2019). It is no wonder then that the majority of GCSE Maths teaching has focussed heavily on the memorisation of rules and procedures and rote learning reaffirming learners' attitudes and beliefs about maths and furthering disaffection (Dickinson et al; 2010; Boaler et al., 2000; Dalby 2013).

College Goals and Learners

Improving employment prospects remain a key part of the college's goal to 'transform lives by offering first class education and training in order to improve employability' (Tameside College, 2021). The focus for the action research must consider how it will add value to developing strategies to ensure that all young people are given opportunity to achieve highly valued qualifications in maths.

The curriculum supports both GM and local authority priority areas and continues to be developed in response to employer skills needs and local / regional business development. The curriculum adequately addresses the priority Greater Manchester industries, fundamental to the future regional economic wellbeing. The specialist Advanced Technology Centre supports recruitment and learner progression into careers within engineering, advanced materials and manufacturing industries and the Health & Social Care Department are supporting careers in health innovation alongside the successful health cadet programme in conjunction with Tameside & Glossop NHS Foundation Trust. Strong links and partnerships within creative and digital media industries, such as Manchester Digital, have enabled the college to develop a robust offer which supports progression into employment and higher education which addresses Greater Manchester's local industry strategy (Tameside College, 2022).

Research Focus

It is important to us to continue with classroom practitioner enquiry. As we have progressed, our understanding of action research (AR) has enabled us to focus on the interaction between the student, their peers and the practitioner with regard to target setting in particular.

In previous years, our research had become diluted as we were following too many strands of inquiry and this year our focus has been far narrower albeit still under the twin umbrellas of Mastery and Motivation.

Initially the AR examined the question ‘Target Setting – How can targets be made more effective for students and teachers? In order to do this, we had to determine what this meant in practice, starting with an assumption that for a target to be effective, students had to engage with it. This led onto how we could make students engage with any targets set and this informed our sub questions to be researched. These sub questions being:

- Given the last two years, do students feel ready to tackle targets?
- For a target to be effective, students need to engage with them. Does the format by which a target is set impact the engagement?
- What resources can we as teachers utilise in order to target a student’s application of maths knowledge skills whilst at the same time be manageable for the teacher?

Literature Review

Introduction

This literature review was approached with the intention of understanding what the current thinking was around what teachers, students and institutions meant by targets, how targets were regarded by teachers and students and how targets impact upon the student from both a motivational and an attainment perspective.

The focus of this review is on what the student requires in order to make progress towards an overall target and that it is the “making progress” that is under investigation.

Background

When looking at the literature on target setting, what becomes clear is that targets are being set to meet the needs of many interested parties and that students are just one of the interested parties. Within the school sector especially, information on students is being collected in order to satisfy the data needs of Government, school governors and Leadership Teams with an emphasis of assessing how well the school is progressing against national averages. The assumption being that if the overall school picture shows improvement, then individual students’ must each be progressing (Higham et al, 2001).

Within FE, information is gathered relating to student retention, attainment and attendance, all key pieces of data when determining overall college performance. Tracking of progress towards achievement is also monitored and in the case of GCSE Maths a minimum target grade will be generated based on previous achievement at GCSE level. There is often confusion as to what the difference is between a target grade and a predicted grade – the two are not always the same (Cooper and Gibson, 2020)

Both in schools and in the post 16 sector, target setting appears to have been concentrated on a top-down approach with institutional targets taking centre stage and “less done to investigate the different approaches to raising the performance of individual post-16 students” (Higham et al. 2001)

From the viewpoint of the school or college, targets are linked to potential final exam grades and “what grade am I working at? “Is a question that we as teachers hear after virtually every assessment. In previous research undertaken by this college, attaining a grade 4 in maths was a powerful motivator for many students. They knew that it was important, even though when questioned further they were not entirely sure why.

It is understandable that both successive governments and institutions themselves wish to monitor overall student cohorts for progress but whilst monitoring pre-determined targets may be efficient their legitimacy should be up for debate. If the focus is only on what is efficient to measure and targets prioritise exam readiness above all else, then does the holistic education of the student suffer? (Fielding,1999)

What determines if progress will be made?

In order for progress to be made, the student must believe that they can make progress and that improvement is within their control (Dweck, 2000; Heine et al, 2001; Blackwell et al, 2007) Without this belief, any possible progress will be stalled. An important aspect of this is in the student's own mindset as it relates to their maths ability. When we look at the literature regarding student mindset alongside anecdotal evidence gained from discussion with the FE providers within the network it is apparent that many of the students within FE have been taught in the lower ability sets at school which is known to have a detrimental effect on these students (Boaler, 2013a; Higgins et al., 2015; Francis et al., 2017; Francome & Hewitt, 2019). From further discussion within the network, it is also evident that although there are many reasons, aside from ability, why students have come from a lower ability group in school, the result is inevitably the same. Students are likely to have been taught a reduced curriculum, which in turn limits the grade that they can attain in schools (Dalby, 2013; Hannula, 2002). This limiting of the grade also means that future grade targets will also be limited, a self-fulfilling prophecy. This when coupled with the lower expectations from their teachers who too often have a fixed belief about learning and potential, automatically fixes the mindset of the students (Boaler,2010; Zevenbergen, 2005). For the student, this compounds the feeling and the experience of failure.

The mindset that a student has towards maths can determine how much effort that student will put into their maths work. For the student with a fixed mind set everything is about the ability they believe that they have and must protect. For example, by staying within their comfort zone and therefore minimising the possibility of failure their “ability” remains protected. Trying new things even with the risk of failure at least in the short term is for the student with a growth mind set (Dweck, Walton & Cohen, 2014). The concept of effort being seen as an indicator of low ability for those with a fixed mind set and as a way to express or increase ability for those with a growth mind set (Dweck et al, 2014).

Students’ perceptions of how their teacher views them is a powerful motivator. A teacher who has high expectations of their students is telling the student that they have potential, if they have potential the teacher will invest more attention in them with more positive feedback and encouragement. (Dweck et al (2014).

We have to move away from targets being based on where the student was or is and be more cognisant of the learning process itself (Meece et al., 2006) so that the students’ self-efficacy grows as they move from thinking about their ability in terms of what they have done previously to thinking about ‘am I capable of doing this?’ (Bandura, 1986; Skaalvik, 1997; Zimmerman and Cleary, 2006). As the students refine their ideas and understand that their ability is malleable, so their mindset changes from fixed to growth (Dweck, 2006).

In Academic Tenacity, Mind set and Skills that promote long-term learning, Dweck et al (2014) put forward the view that student achievement goals can be divided into Performance and Learning Goals. These correlate to the fixed mind set view that performance “proves” ability and that you want to perform well with minimal effort (equating effort with low ability). A learning goal on the other hand takes the growth mind set view that learning “improves” ability and that a mastery approach enhances the learning. The idea that there is a correlation between Mastery and Growth Mind set is not new and although the ideas around mastery have been interpreted and developed in different ways (see for example National Association of Mathematics Advisers (NAMA), 2015; NCETM, 2016) that correlation can still be seen. If we align the NCETM’s 2016 publication The Essence of Maths Teaching for

Mastery with Carol Dweck's 2008 article on Mindsets and Math/Science Achievement, the correlation is evident:

Maths Mastery (NCETM, 2016)	A Growth Mindset Approach (Dweck, 2008)
Maths teaching for mastery rejects the idea that a large proportion of people 'just can't do maths'.	A belief that talents can be developed, and great abilities can be built over time.
All pupils are encouraged by the belief that by working hard at maths they can succeed.	A belief that effort creates success.
Making mistakes is to be seen not as a failure but as a valuable opportunity for new learning.	A belief that mistakes are an opportunity to develop.
It is recognised that practice is a vital part of learning, but the practice is intelligent practice that aims to, develop students' conceptual understanding, and encourage reasoning and mathematical thinking, as well as reinforcing their procedural fluency	Encourages thinking about learning and rejects staying in a comfort zone.

The 2014 study makes the further point that mind set and having the right goals are not necessarily enough. For a student to reach their full potential then they must have "perseverance and passion for long term goals "or as an American term as this was an American study – "Grit". The study goes onto say "academic success requires more than ability. It requires the application of ability and the growth of ability through sustained hard work ". The study goes onto advocate the teaching of students in how to set goals, identify obstacles and monitor their own progress towards those goals. To help students with this, teachers could break the goals down into smaller steps that the student could see as challenging but attainable. (Dweck et al, 2014)

What makes an effective target?

Cooper and Gibson (2020) found that teachers were often having to explain the difference between a target grade and a predicted one. Target grades are not 100% reliable based as they are on what has gone before. For secondary school pupils in particular, target grades were generally fixed on entry to the school with high SATs achievers being streamed into the higher sets etc. As noted by one teacher in the study "……high targets mean that a pupil is put into a high set and pushed. It is disadvantageous if you have a low target and so …there are low aspirations…" (Cooper and Gibson, 2020)

For students knowing the grade, although they want to know, can be either demotivating or allow students to assume that once they have hit a certain grade then they do not have to do anymore. This was particularly pertinent for this college (and it is reasonable to assume others) when generating Teacher Assessed Grades last year. "They don't read the comments or work to improve, they fixate on the grade" (Cooper and Gibson, 2020).

If we only give students targets that relate only to exam grades, then we run the risk of students only being motivated by exam success and only undertaking work that has an exam focus. The motivation to do the work is extrinsic and focuses on exam performance rather than intrinsic motivation where deep rather than shallow learning is encouraged. When students fail, as many of them their self-efficacy will reduce along with the amount of effort, they are willing to expend in the future (Tanner & Jones, 2003).

Dagley (2004) looked at targets from the student perspective and found that the most useful targets were those that were specific to them and included strategies for how to achieve them, scaffolding the targets was deemed particularly useful.

Rather than set targets based upon the students' grade potential only, the student as a whole should be looked at. Ownership of the targets should sit with the student albeit having been negotiated with the tutor and that ownership has cognitive, emotional and motivating elements (Martinez, 2001). As Mastery learning involves deep learning, targets incorporating it can be powerful and motivational tools especially for low attaining students (Black & William, 1998).

Peter Jarvis (2002) looked at the link between tutoring and target setting and found that although students found the sessions useful and effective their focus was on exam readiness. Although the intention had been to promote independent learning alongside academic content the students' struggled to articulate what learning had taken place. They knew when they understood something new but struggled to explain how they reached that understanding. They were unable to make the link between effective learning strategies and how that could impact positively on their performance. They understood targets that were focussed on a particular subject but not targets where the aim was to improve the process of learning itself. Younger & Warrington (2009) looked at linking target setting with mentoring and found that it had a positive impact upon the confidence, self-belief and academic achievement of students especially those who were looking at Further Education after school rather than sixth form where much of the academic push was coming from parents.

This is the dilemma for all teachers, how do we create targets that both satisfy the need to show progress towards academic attainment, a need evident in both students and institutions, alongside the aim of developing autonomous independent learners. One approach could be to use assessment as a means to analyse students' strengths and weaknesses (Tanner & Jones,2000) in that it is the analysis that is important rather than the target that then arises. Petty (2004) advocates the use of Mastery tests whereby students have the chance to re-do assessments when they have had a chance to practice what they could not do before and what they themselves have identified as needing additional work.

The student has to feel an ownership of any assessment that leads to a target Black & William (1998). Targets that focus exclusively on exam preparation work push all other work that may be meaningful to one side. They are no longer fluid and student centred but have become teacher led, prescriptive and above all efficient for the teacher if not the student (Fielding, 1999).

A crucial point in these studies seems to be with the discussions taking place between the teachers and the students in discussing and setting these targets. The academic discussion with students although time consuming was the most worthwhile in helping students achieve their targets (Dagley, (2004), Cooper and Gibson (2020). The importance of communication between student and teacher cannot be underestimated and has to take place often enough to be most effective, Jarvis, P (2002).

Conclusion

From reading the literature around this topic it is clear that in order to set effective targets for all students, a robust start point is required from which the student can move forward. This is so they know both what success looks like and where they currently stand in relation to that success (Hodgen, J & Wiliam, D, 1998). The start point can take the form of their previous exam scores but as this may be too general, it is likely that an initial assessment may be utilised in order to give the depth of evidence required in order to determine students' key weaknesses and strengths. There is an assumption here that the teacher has been able to use their professional judgement as to the robustness of the start point assessment so that it gives enough information from which to determine what the student needs to work on.

As the literature also says, teachers need the time to engage with their students and to set holistic targets that focus both on academic content as well as the wider aims of promoting a positive mindset. This in turn leads to students who are motivated to learn rather than simply to cram for an exam. Targets set by the teacher should be realistic, challenging and discussed at the level of the individual student (Younger & Warrington, 2009). They should offer a clear pathway showing how students can achieve them. For students to get the most out of targets, their teachers need the time to formulate, discuss and implement targets in conjunction with the student and unfortunately time is often the limiting factor in all our interactions.

Methods – What methods did we use in order to gather information?

Methods

Aim and Objectives

Conducting the literature review highlighted the importance of Targets to students, teachers and educational establishments. This allowed the action research group to arrive at the initial aim:

Target Setting – How can it be made effective for students and teachers?

This initial question has been broken down into three sub objectives, which we aim to answer over three cycles of action research:

1. Given the last two years, do students feel ready to tackle targets?
2. For a target to be effective, students need to engage with them. Does the format by which a target is set impact the engagement?
3. What resources can we as teachers utilise in order to target a student's application of maths knowledge skills whilst at the same time be manageable for the teacher?

Research methodology

The analysis of the literature review, along with evaluation of 19-20 first Action Research (AR) cycle allowed the refining of the research question and a focus emerged allowing for the research design to be shaped.

With consideration to the practicalities and workings of FE, the AR also incorporated some of the design elements of an ethnographic research project in that the research was conducted largely from the teachers practising within the field (Hamersley and Atkinson, 2007). The marrying of AR and ethnographic research is common amongst educationalists as the ethnographical element directs the process whilst the AR connects the research back to the study's plans and activities.

As we wished to have a deeper breadth and depth of understanding and corroboration whilst combining the use of both qualitative and quantitative perspectives to maximise the strengths and minimise the weaknesses of each type of data (Johnson et al., 2007; NIH Office of Behavioural and Social Sciences, 2018), we concluded that we would take a mixed method approach (See table 1). There was, however, an acknowledgment of the importance of maintaining validity (Johnson & Christensen 2017) and so it was paramount that the data collection design be mindful of the need for multiple triangulation opportunities and quality of data (ibid.).

Data Collection Methods

Initially, a questionnaire was sent out to all students. The questionnaire followed a mixed methods research approach, collecting both quantitative and qualitative data. Mixed methods research can reduce bias in research and increase the accuracy and reliability of data through triangulation (Denscombe, 2010). Following this, as there are two cycles of action research in this project and a pilot, a further two data collection methods were used: teacher reflections from observing their students and student interviews, collecting mainly qualitative data.

Data Collection Method	Number of Participants
Initial Student Survey	370 Students
Teacher Reflections	6 Maths Teachers
Student Interviews (Cycle 1)	18 Students
Student Interviews (Pilot)	8 Students
Students (Cycle 2)	45

Covid Impact

Owing to either staff or student absences as a result of Covid, not all participants could undertake the research at exactly the same time and so results had to be gathered over several weeks. As there were time constraints, this necessitated the use of a pilot project alongside two Action Research Cycles rather than the three originally envisaged.

Ethical Considerations

Taking note of the BERA Ethical Guidelines (2004), all participants were fully appraised of the research project, the beneficence (Murphy & Dingwall, 2001) and the use any outcomes would be put to. An awareness of the potential conflict of a dual role as both a teacher and a researcher were considered but all students will be assured from the outset that their learning experience and issues surrounding confidentiality will not be impeded by this study. In addition, informed consent was sought, and all students were reminded that their participation was voluntary with right to withdraw at any time (BERA, 2004). Furthermore, students were assured that they would not be identifiable, as individuals, from the final report (Flick, 2006). Finally, all interested parties were assured of the mechanisms that were used for processing and storing the research data in line with Data Protection Act 1998 (DPA 1998) and any concerns with regard to GDPR will be discussed as appropriate.

Results and Discussion

Overview of what we did

The research process was originally to be an initial survey (Appendix 1) followed by 3 distinct Action Research Cycles. Owing to the impact of Covid and from that the constraints placed upon every one's time, this became an initial survey, two Action Research Cycles and a pilot. The initial survey had the largest number of students involved (370) and the other activities had smaller student numbers (pilot 8, other cycles circa 40-50)

Initial Survey Results

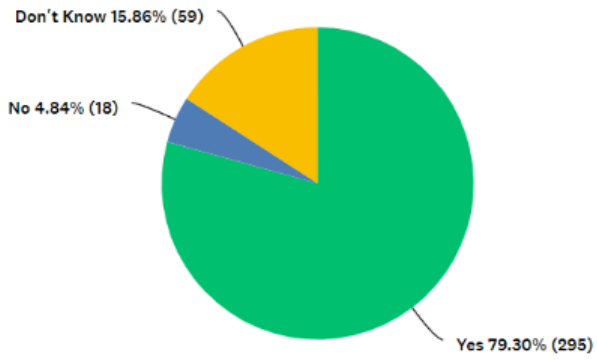
The survey was sent out to all students and we received responses from circa 370 students. Questions were focussed upon their overall maths resilience and then upon their thoughts regarding the setting of targets in maths.

Resilience and Attitudes to Problem Solving

There were 8 questions regarding student attitudes and a summary of their responses is shown below:

Do you believe that hard work will eventually pay off?

Answered: 372 Skipped: 10

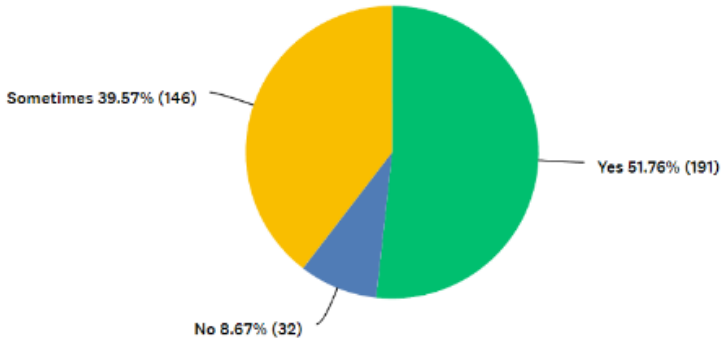


ANSWER CHOICES	RESPONSES	
Yes	79.30%	295
No	4.84%	18
Don't Know	15.86%	59
TOTAL		372

An overwhelming majority of students (79%) believed that their hard work would pay off

Do you keep trying even when things seem difficult?

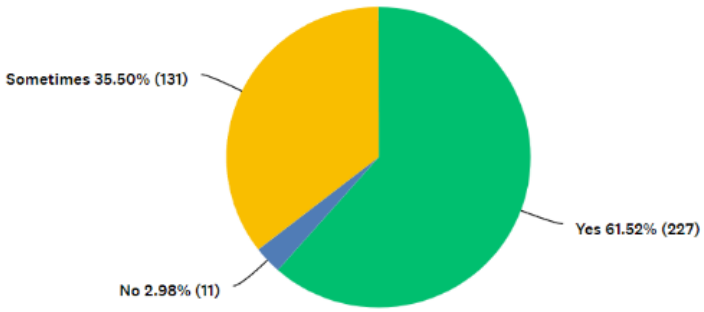
Answered: 369 Skipped: 13



ANSWER CHOICES	RESPONSES	
Yes	51.76%	191
No	8.67%	32
Sometimes	39.57%	146
TOTAL		369

Do you feel like you can handle problems if you are willing to work hard?

Answered: 369 Skipped: 13



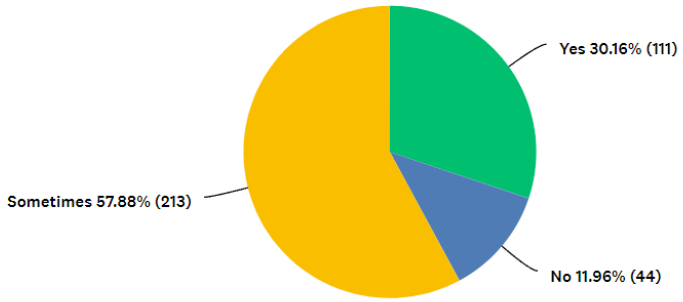
ANSWER CHOICES	RESPONSES	
Yes (1)	61.52%	227
No (2)	2.98%	11
Sometimes (3)	35.50%	131
TOTAL		369

This correlated with the responses to two other questions where 61% of students felt that they could handle problems if they worked hard and 52% of students felt that they would continue to try even if things seemed difficult

Student responses to how they coped with setbacks and problems encountered along the way were a little more nuanced.

Do you feel like you can manage unexpected events that come up?

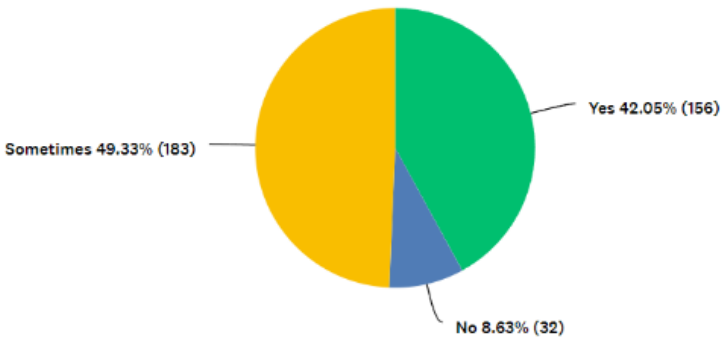
Answered: 368 Skipped: 14



ANSWER CHOICES	RESPONSES	
Yes	30.16%	111
No	11.96%	44
Sometimes	57.88%	213
TOTAL		368

Do you feel like you can come up with solutions when you are facing a problem?

Answered: 371 Skipped: 11

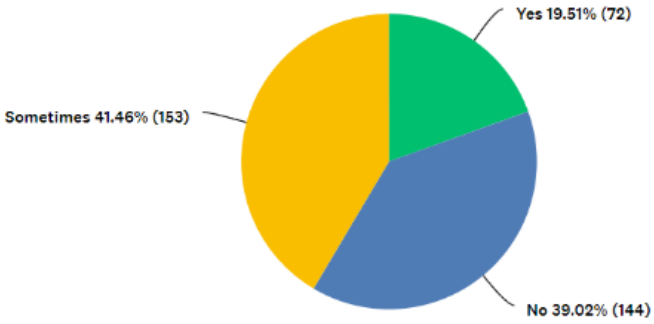


ANSWER CHOICES	RESPONSES	
Yes	42.05%	156
No	8.63%	32
Sometimes	49.33%	183
TOTAL		371

In answer to the two questions posed above, the highest response was that of sometimes (58% & 49%) rather than an outright yes (30% & 42%) which implies that students had met with situations in the past that they felt unable to manage or find a solution for.

Do you perform well even under pressure?

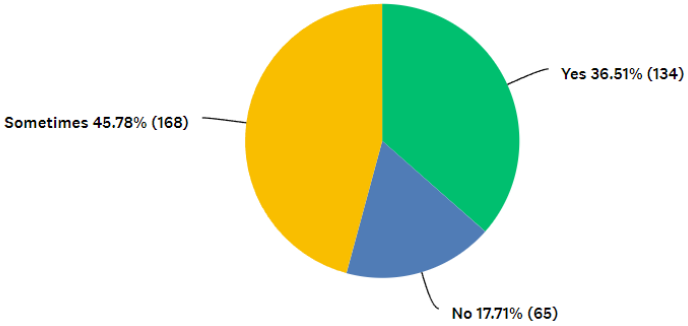
Answered: 369 Skipped: 13



ANSWER CHOICES	RESPONSES	
Yes	19.51%	72
No	39.02%	144
Sometimes	41.46%	153
TOTAL		369

Are you able to bounce back fairly quickly after stressful events?

Answered: 367 Skipped: 15



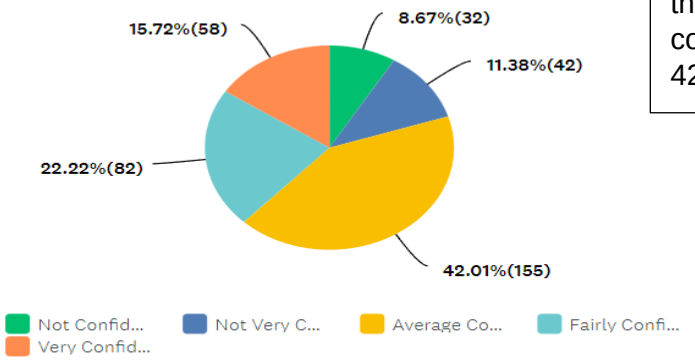
ANSWER CHOICES	RESPONSES	
Yes	36.51%	134
No	17.71%	65
Sometimes	45.78%	168
TOTAL		367

Student responses to how they performed under pressure showed that 20% felt that they performed well whilst a slight majority (41% v 39%) sometimes performed well. Their ability to bounce back after a stressful event showed a similar profile with 36% able to bounce back quickly, 46% sometimes bouncing back and 18% feeling that they did not bounce back quickly.

How confident are you in your ability to achieve your goals?

Answered: 369 Skipped: 13

Initial student confidence in achieving their goals was 20% feeling not very confident, 37% feeling confident and 42% feeling averagely confident.



	NOT CONFIDENT (1)	NOT VERY CONFIDENT	AVERAGE CONFIDENCE	FAIRLY CONFIDENT	VERY CONFIDENT (5)	TOTAL	WEIGHTED AVERAGE
☺	8.67% 32	11.38% 42	42.01% 155	22.22% 82	15.72% 58	369	3.25

Responses to Target Questions

There were 6 questions relating to targets and the responses can be summarised as follow:

- 82% of students felt that they should be given targets
- 50% felt that these targets should be set by teachers and students together
- When asked how often targets should be set, 35% said every week and 35% said every half term with a further 24% suggesting every month – when discussing this with students afterwards it may be that this response was determined by what their respective schools had done in the past
- When asked if they had completed targets previously, 57% said they had and 32% said they had sometimes
- When asked what had stopped them, 46% had felt that the targets were not clear enough that they knew what to do and 35% felt that they were either too many or too hard

Our initial thoughts

From these responses our initial thoughts were:

- Students were generally positive about their abilities to work hard, tackle problems as they arose and pre-disposed to attempt targets set.
- It was particularly pleasing to see that a significant majority (79%) felt that their hard work would pay off
- Student responses to tackling problems and managing the unexpected was less clear with most saying that they could do this sometimes
- The majority did feel average confidence in achieving their goals which contrasts with work done which said that ¼ of young people report that the pandemic has "destroyed" their career aspirations. (Prince's Trust Tesco Youth Index, 2021)
- There was more ambiguity around how often targets should be set and in later discussions with students, what their previous schools had done with respect to targets played a big part in what students assumed was the norm.

Action Research Cycle 1

Targets set following Initial Assessment and utilising online videos

Following their initial assessment, 3 targets were set for each student concentrating on their underpinning number skills. The targets were set using an online platform (MathsWatch or similar) where they were directed to watch a video and then answer questions. We would then interview a selection of students to see what they thought about the process.

This was carried out for two classes (21) within Tameside College and two classes within a partner college (16) We then selected a number of students (10) who had completed the targets set and a number (8) who did not to answer a number of in-depth questions (Appendix 2a&b). The student responses were then analysed so that the main themes could be identified.

Our results are summarised below:

Do you think about your maths outside of the classroom? (Both)

Six students said that they thought about maths outside the classroom and this was split evenly between completers and non-completers. Four said that they only think about it if they are doing revision The remaining students do not think about it at all.

There still appears to be a divide for students between their main qualification/outside college life and maths in the classroom.

What type of homework could help you with this? (Both)

A majority of students would prefer to have homework on paper and for specific topics

Can you tell me if you watched the videos carefully and then tried the questions or did you jump straight in? (Completers only)

All ten completers said that they went straight to the questions without watching the videos The comment that they only watched the videos “if they absolutely had to” came up more than once

Anecdotally, it is often assumed that given the choice students would opt for online work as opposed to paper based however most of the students asked preferred paper to work on and did not engage with videos. It was beyond the scope of this research to investigate this in more depth.

Can you tell me why you did not complete the targets set? (Non-Completers)

Student responses here included having too much to do on their main course, not being bothered and two students said that as they were online “they were easy to ignore”

Why do you think that you attempted these targets when others did not? (Completers)

Four students felt that they wanted to keep trying Four students said that they had always done targets set in the past Two students said that their teacher had reminded them

It could be inferred that those who completed targets on-line did so because that is what they would normally have done. It is interesting that students made the comment that they were easy to ignore as they were online and again this may be worthy of further investigation.

What do you think about targets? Do they help you to make progress in maths? Could you give an example of where they have helped in the past? (Both)

Four students thought that there was a possibility that targets especially those related to grades could demotivate students Six students felt that to be the most useful, they would want more opportunity to practise the work they were doing towards the target set Three students felt that they identified where they (the student) had gone wrong and so were useful for both them and their teachers The remaining students were unsure if targets helped them to progress

Half of the students asked did feel that that targets did help to make progress albeit with additional practice and understanding where they had gone wrong. Targets are often linked with grades, and it is interesting that four students felt that this could be demotivating. Further work has been done on this by our other Action Research group.

Which would be better for you – instant marking (√ or x) or taking longer but with written feedback? (Both)

Students were split evenly on this question, where feedback was preferred the majority would opt for face to face feedback as well as written. When pressed as to why, students said that they could clarify what they had to do

One of the benefits of online work has been in the availability of instant marking both for the student and the teacher (in that it reduces marking load). However, half of the students asked wanted the feedback so that they see what they had to do to improve. A number of students wanted the face-to-face contact when getting feedback so that they could seek further clarification.

We used video links to help you with the targets we set, do you find videos help to show you what to do? Are there other videos, websites or games related to maths work that have helped you in the past? Are there any online resources that you would recommend to a friend? (Both)

Students preferred the videos to be short, to include step by step instructions and to refer to exam questions. They were not seen as a substitute for teacher input but as a back-up tool

Student comments on videos specified that videos where used would need to be short and focused on their (the students') requirements. This implies that perhaps not all videos are unwelcome but that they have to be carefully chosen.

When we set targets for you in the future, when should we set them and how often? How should they look or sound? Should they be homework or in class? (Both)

All students asked said that they would prefer students to be set for in class work The majority of students wanted additional practise for targets with a significant number requesting that they revisited targets each week There was no consensus on how often targets were set but the majority of students asked wanted targets to be revisited.

Pilot Cycle – Action Research with a small group looking at simple underpinning targets on number

This was an investigation with a single class of students (8) where three targets were set per student based upon their previous assessment results specifically looking at their number skills and utilising worksheets from Mathswatch. We had agreed with the literature here that a robust starting point is vital so that both the student and teacher have a fixed point from which they can then move forward. (Hodgen, J & William, D, 1998). Although the students had minimum target grades (one grade above their start point) ranging from 1 – 4, this was not detailed enough to give a true picture of where the students actually were in relation to their number skills.

The assessment (see separate Appendix 4) had been broken down question by question (with number topics being picked out) and the answers identified green as receiving full marks, amber where some marks were achieved and red where no marks were awarded. By doing this it was easy to identify individual issues as well as group themes. (See Appendix 3) Targets could then be set accordingly for each student. This also enabled the teacher to pair up students appropriately.

The class was split into pairs where each pair could work on a single target common to both of them. This was irrespective of their initial starting grades. They were able to discuss their answers, ask questions of each other and the tutor and complete as much of the worksheet as they could in an allotted time of 10-15 minutes. The targets were short and focussed on a single number skill at a time. Each student had three targets specific to them and their partner could change each week. Following the completion of the pilot (over 3 weeks) the students were then asked for their feedback as a group which was cross referenced with the teacher's observations during the sessions.

Where required, initial guidance was given by the teacher as to how to answer a question and any misconceptions corrected and discussed.

The majority of the group (6) were able to engage with the exercises independently and discussed within their pairs how to tackle the questions and having checked that they were in agreement carried on completing each exercise. On occasion there were some robust discussions of how to proceed. They asked minimal questions of the teacher after having confirmed their initial few questions were correct and moved successfully through the rest of the worksheet. They were able to self-correct each other and completed the exercises within the given time frame.

Two of the students were more reticent in committing answers without double checking with the teacher that they were correct first. Although the students knew each other they were not as comfortable as the others in working together on a maths problem. As these two students were similar in that their targets were the same, they were kept as a pair throughout the 3 weeks in an effort to make them feel more comfortable. There was some improved peer interaction, and the students did make some progress but still required more teacher input.

The group were then interviewed for their thoughts and typical responses are shown below in student vignette form.

<u>Student A</u>

> *It was ok – I could see what I needed to work on from my assessment. I liked that I knew where I had gone wrong. It did not go on too long so it wasn't too boring.*

Student B

the questions were on the same thing – I got that better than mixing them up and that meant I could get what I had to do. We only had 10 minutes so we got on with it

Student C

I liked that it was things me and …… had to work on from the test. It was good that we could talk about how to do the sums and could practise them. I like to get it in my head. It was better than doing at home – I could ask …….. or my teacher if I was not sure.

Student D

The questions were ok and not long. I could not remember what to do at first but then I did after the first one and I could help ……. That was good

Teacher Observations

I was unsure as to how the students would react to the worksheets initially but as soon as they realised that they related directly to questions they had got wrong in the assessment they wanted to start straight away. They knew that they had a time limit (10mins) and this meant that they got going quickly and kept each other on track.

Summary of Results

The students were positive about the exercise. They found the repeated practice useful and could focus on one small point at a time. There was, in the majority of pairings, discussion about how to proceed and they could keep each other on track. The students remained on task as the targets were short in length and had a given time limit.

As the targets were based upon their own previous assessments, the students felt that they had ownership of the target (Black and William, 1998). For the teacher, the discussions taking place were invaluable in getting to understand and know the students and where their misconceptions were (Dagley, 2004; Cooper & Gibson, 2020).

Action Research Cycle 2

Targets set following cycle 1 and the pilot exercise

Both the first cycle and the pilot had focused on the underpinning number skills that students needed to work on and we now wanted to look at how students apply those skills in an exam style question. For many students it is the format of the question that causes angst not

necessarily the maths behind it and this was the next thing to tackle. We were looking here at a strategy that could be employed over a range of questions (ratio table) and a way to see the maths skills that come together in a problem-solving question (de-constructed exam question).

By focusing on application of knowledge skills, the resources could be used in a group setting thus easing teacher workload but would also be relevant to the individual student.

In order to do this, a number of resources were created that were then delivered to groups within the both the college and partner colleges. The resources were each stand-alone and incorporated the use of a ratio table and de-constructed exam questions alongside the opportunity for additional practice. Teachers were encouraged to go through a teacher led example utilising a ratio table before the students had a go themselves as this may have been a strategy that students had not seen before. Students were encouraged to write down what they were doing as they worked through the questions. They were placed in pairs or small groups so that they could discuss with peers (Appendix 5&6).

Following this exercise, the delivering teachers were then asked a number of questions the answers for which would be based upon their observations of their students (Appendix 7).

We were interested in both what the teacher thought of the resources as well as their impressions/observations of what the students thought. The resources all had the same questions to be answered but for ease of analysis they have been split into 2 sections – 1st section involving use of a ratio table and 2nd section the de-constructed exam questions. Time pressures meant that not all teachers were able to utilise every resource, but we were able to get results from a cross section of students. Our results are described and interpreted below:

What was useful about this activity?

Teacher Led Example and Best Buys (5 teachers/@45 students)

"Allowed students to explore the numbers involved without worrying a specific outcome"
"Offered additional practice in multiplying/dividing quantities so as to see what quantities they could get to"
"Spoke with each other as to what they could do – sometimes quite forcefully!"

In general, students could manipulate the numbers without having to get straight to an answer and because the manipulation was something that they could do they were able to go as far as they wanted. The activity was focussed equally on the process of tackling a problem as well as the problem itself and the students were able to discuss the process amongst themselves without the pressure of having to get to a correct answer.

Working with Weight and Money (4 teachers/@45 students)

The breakdown of the question allowed students to approach the question in chunks which seemed manageable
The best part I think was that it had all the students working throughout the period we allocated to it. Some were working on different parts

Everyone could answer at least 1 sub question independently
The students were able to methodically answer some parts of the question

By “chunking” the question, teachers found that all the students could work on at least one part of the question. This meant that all students could access this resource without any student feeling that they were given easier work than others – something students do pick up on.

Do you think that your students would be encouraged to have a go at a similar question?

Teacher Led Example and Best Buys (5 teachers/@45 students)

“I think they would, however they would not draw quite an extensive table as they told me it took them ‘too long’”
“I had to reinforce the use of the method to explore the second question given even though I had put it on A3 for everyone to access”

For many of the students, they just want to get to the answer rather than exploring the process of how they can arrive at a correct answer – an approach we found mirrored in the literature review - They were unable to make the link between effective learning strategies and how that could impact positively on their performance Peter Jarvis (2002).

Working with Weight and Money (4 teachers/@45 students)

In their own words: “I would never have tried this question before”
There was lots of analysis about the fact that it was not as complicated as they thought and how they might look at other questions in this light
They were nervous about getting it wrong, but most had a go
In their own words: ‘In fact, I am brilliant at Maths’. For sure they left the class in a very upbeat way, feeling successful

As students were able to access these questions at varying points and could see how the various parts of the answer built up to an overall answer, they felt confident to work through it.

After completing this, do you think that your students would feel more confident in tackling similar questions?

Teacher Led Example and Best Buys (5 teachers/@45 students)

they did not all “get” that they could apply the same methods to the non-scaffolded example so additional reinforcement was required
I think that they would need more practice. They resist taking any steps independently most of the time
Those with less confidence to start with were reticent to write anything down “in case it was wrong”. They would require additional practice

Working with Weight and Money (4 teachers/@43 students)

They would need to practice more of these including how to break them down themselves
Repeated practice would make the students feel more confident
Students found it easier to “verbalise” what they did rather than writing it down

More work is still required on building student confidence to apply their maths skills to similar problems and indeed to recognise for themselves when such skills can be applied. Students remain reticent about putting pen to paper to show their reasoning although will answer questions verbally. This is not unusual in re-sit students and is a skill that they need to be encouraged to practise especially for the A03 exam questions. This was looked at in the Action Research project undertaken by my colleague.

What could be improved for next time?

Teacher Led Example and Best Buys (5 teachers/@45 students)

“Add in extension activities for students who completed it quickly”
“Possibly having more challenging questions available”
“My learners tend not to like having too many options, and too many things to consider. I teach proportion by the unit method, of finding 1kg then going from there”

The classes were of mixed ability, and it became apparent that for some students they could get to the correct answer quickly without the scaffolding of the ratio table as they already had a method. The resource was not intended to replace an existing method that students were comfortable and confident in using but rather to show an alternative method that could be applied.

Working with Weight and Money (4 teachers/@43 students)

A picture of the weights on the bars and a picture of the seats layout would be useful
I think a diagram would help the students understand the question better

Here a diagram would be useful in that it enables students to “see” what is happening but, in this case, there were some students who had limited experience of what a venue with seats in rows actually looked like. Contextualisation of questions that students can relate to is key.

Conclusions and Recommendations

Conclusions

As many FE students have come to college with poor grades, little intrinsic motivation and often a fixed mindset about maths, it is important that any maths teaching that they now experience be mastery orientated as opposed to performance orientated. (Maehr & Midgely, 1991; Meece et al., 2006).

A recent systematic review of the impact of the pandemic on young people prepared for SAGE found considerable impacts across the range of emotional, behavioural and restlessness/inattention problems, and overall psychological wellbeing of young people (Tameside College 2022). Anecdotally, colleagues both internally and externally have reported a rise in all of these issues in their students. However, our student survey did find a positive attitude towards hard work paying off (79%) as well as a majority (82%) saying that they should be given targets.

The use of online targets is often used both as a way of providing instant marking for the learner (and reducing teacher workload) and as a way of allowing students to work when was convenient for them. However, our results showed that although there was an approximate split in those who completed targets and those who did not, the majority would opt for targets set on paper and in class. Reasons given for this included the ability to receive and discuss feedback, a dislike of watching videos and that online targets could be ignored. So, it could be argued that technology cannot replace the physical presence of learning such as spontaneous discussion (Chen and Lambert, 2018).

Through the use of clear learning targets that are developed in conjunction with the students, teachers can collect accurate evidence of student learning, provide students with effective guidance and feedback and help students take ownership of their learning (Konrad et al., 2014). By individualising and focussing directly on student requirements by relating targets set directly back to the assessment in the Pilot exercise, the teacher and students were able to work together to develop a growth mind set within the classroom by building confidence as they completed the tasks together. As Jarvis (2002) noted, the value of communication between student and teacher cannot be underestimated.

For teachers, the time spent with students whilst discussing, developing and implementing targets has been invaluable. By observing students and their working processes both during the Pilot exercise as well as Cycle 2, teachers can better understand the issues that students may have and can offer support so that the student feels more confident when tacking similar issues. We can relate this back to the literature review where academic discussion although time consuming is worthwhile in helping students achieve (Dagley (2004) & Cooper and Gibson (2020))

For the de-constructed questions, there was a sense of accomplishment in students as they were all able to access the activity which meant that many students got a confidence boost. For these questions, we had employed a low entry, high ceiling strategy which was found to be effective.

It was apparent, from the teacher observations that students would require more practice in the use of ratio tables especially. For many of them they were in a hurry to arrive at an answer rather than fully exploring all possible outcomes thus perhaps limiting their ability to see this as a transferrable strategy.

For both questions, teachers observed a reluctance to write down what they were doing although students were able to verbally answer questions. This links back to the literature where Jarvis, (2002) had also noted that students struggled to articulate what learning had taken place.

In order to develop an environment where teachers and students can work together to create meaningful targets that the student can work towards, the most important element from our results was that of time. Students need the time to focus on specific issues for short term targets, time to discuss with others how to tackle a specific target and time to practice the "tools" that were useful in applying their maths knowledge.

There is a hidden message being stated too when the teacher spends time with the student. If we turn what Dweck et al (2014) said around, by giving a student positive attention, then the teacher is telling the student that they have potential and that goes hand in hand with high expectations of what the student can do.

As Dagley (2004) said, the most useful targets were those that were specific to them and included strategies for how to achieve them, scaffolding the targets was deemed particularly useful. This may be why our students "only watched videos when they had to "perhaps an online platform is not specific enough for our students. That is not to say that online does not have a place but rather that we need to look at the online provision as a separate entity and that was beyond the scope of this paper.

As found in the literature review (Meece et al., 2006), our students found it harder to focus on the learning process and how they worked towards the answer as opposed to rushing to get to the correct answer. However, with time spent on repeated practice and targets that emphasis the skills of how you tackle a problem, this can be overcome.

Recommendations

As colleges we need to:

- Develop the idea amongst students and staff that targets are not the "end goal" but rather a series of steps that students need to navigate over time in order to make progress

- Implement short term very focused targets that concentrate on only one issue at a time as appropriate for students to aid their fluency skills and allow students time within class to practise and discuss these

- Utilise a range of resources that allow all students the opportunity to tackle a range of problems by breaking down how they can apply their skills/knowledge as well as providing strategies that are transferrable

- Develop online resources that complement and enhance the work done within the classroom so that they are seen not as a chore but rather an integral part of independent learning

- Allow teachers the time to work with and alongside students on their targets

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