



**SHAPING SUCCESS ACTION
RESEARCH PROJECTS**

**FINAL REPORT ON THE SHAPING SUCCESS AR PROJECT –
INVESTIGATING STRATEGIES TO HELP LEARNERS SOLVE
FUNCTIONAL SKILLS MATHS QUESTIONS**

Macclesfield College

Macclesfield College (2021) *Final Report on the Shaping Success AR Project – Investigating strategies to help learners solve Functional Skills maths questions*. London: ETF.

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This resource was produced as part of the Education and Training Foundation's OTLA programme, which was funded by the Department for Education. To learn more about the OTLA programme please visit: <https://et-foundation.co.uk/supporting/professional-development/practitioner-led-development-and-research/otla/>.

For further information regarding the Shaping Success Action Research programme and this project go to <https://ccpathways.co.uk/practitioner-research/otla-7/>.

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Contents

Final report - Investigating strategies to help learners solve Functional Skills maths questions	2
Appendix 1 – The project team	9
Appendix 2 – Sample of initial questionnaires.....	10
Appendix 3 – Sample set of questions	12
Appendix 4 – Transcript from session.....	13
Appendix 5 – Student work showing strategies.....	16
Appendix 6 – Maths only questions.....	21
Appendix 7 – Completed exit questionnaires	22

Final report - Investigating strategies to help learners solve Functional Skills maths questions

Macclesfield College

This project was designed to support learners studying Functional Skills maths and to raise their confidence, competence and achievement in this subject. The aims of the project were to:

1. Work with the learners to identify what presented the challenge and barriers when completing Functional Skills maths questions.
2. Develop strategies to overcome the barriers with the learners and make these strategies available to a wider audience.

Summary

The project, which focused on language barriers in Functional Skills maths, was delivered by Macclesfield College. Macclesfield College is a provider of Further Education, Higher Education and skills training; serving the Cheshire East area and beyond. The project was led by the head of maths and English with involvement from the Functional Skills maths teacher, GCSE teachers and the one-to-one intervention teacher. One-to-one sessions were delivered to learners over a period of six weeks. These revealed common areas of concern amongst learners. Over the course of the six weeks a range of strategies were trialled and developed with the learners and those with the most impact were then used in classes. The project reported an increase in confidence among the learners who adopted the strategies and a positive response from the teachers involved. In the majority of cases, there was an increase in achievement rates for those learners using the strategies.

Rationale

The reform of Functional Skills mathematics has brought an additional challenge to the qualification. Questions in Functional Skills require a good command of the English language, even more so since the reform. Many learners struggle with reading the question and decoding a mathematical operation embedded within the question.

In house self-assessment and review identified achievement in Level 1 Functional Skills maths as an area for improvement. Despite good and outstanding teaching and a robust planning and assessment cycle, learners were not succeeding at the desired rates. This project was identified as an opportunity to explore the reasons behind this lack of success.

The aim of the project was to give an insight into how learners perceive questions, identify the real barriers to achievement and develop tools to overcome them.

It was hoped there would be a positive effect on the learners taking part in the study and that they would gain confidence and realise their mathematical knowledge is not necessarily their stumbling block.

We aimed to offer them a variety of support approaches to help them to move forward. Support would be personalised and could be either focused around maths, reading or comprehension (or a mixture of all three).

Approach

- We began the project by asking learners to complete a questionnaire that examined their views on maths and what they found challenging about the Functional Skills exam. (Appendix 2) The results of the questionnaire were useful and identified a common concern amongst all learners. Word problems seemed to be the issue, with all learners identifying word problems as one of the areas that caused them problems at school or, in a previous year, at college.
- Learners identified that the number of words in a question is a barrier to them so a way of breaking a question down would be useful.
- Initial questioning was followed by a session that explored strategies with the learners. The questions given in each session were similar, to allow learners to get to grips with the strategies (Appendix 3). Learners explained what they had difficulty with and collaborated with the project lead to develop strategies that would help them (Appendix 4).
- The project lead and learners studied a variety of mechanisms designed to make the question more accessible. These included: highlighting, annotating, drawing images, storyboarding, posing questions, breaking a question into parts/ steps, ticking off elements as they were completed. Learners were provided with pens and highlighters as appropriate.
- These mechanisms and strategies were trialled in subsequent weeks. Initially these sessions were face to face but, due to the effects of COVID-19, some sessions were delivered using Zoom or MS teams. Learners were able to explore all the strategies but, in every case, certain strategies were proving most popular. Learners seemed to prefer the strategies of underlining key information and ticking off elements as they were completed. Additionally, using diagrams to represent time also supported learners in adding amounts of time (Appendix 5 and shown here in the image below).

OLTA Project question Week 3

1.

I am planning a party. I have booked the local Scout hut for the party. I am inviting 50 guests.

My guests arrive at 8:30pm. I need to do the following:

Set up the hall – 40 minutes ✓

Bake the food – 1 and a ¼ hours *1hr 15mins*

Collect my friend from her house – 20 minutes (must be after 7pm) ✓

Decorate the hall – 1 hour 45 minutes ✓

What time do I need to be at the hall to ensure I can do all these things?

$$1\text{hr } 15 + 1\text{hr } 45 = 3\text{hrs.}$$

$$40 + 20 = 60.$$

4:30 start.



- Over the subsequent sessions these strategies were refined, working closely with the learners to ensure they got maximum benefit from using them.
- Learners were given a set of two questions each lesson and asked to recall the strategies. Once they had recalled them, they were asked to highlight what they thought was important in the question. As they completed parts of the question, some learners needed to be reminded at every step of the problem to tick elements off, other learners were competent to do this independently.
- An additional session was included that took out the language/ words to allow learners to focus solely on the maths. This was added in response to learner feedback (Appendix 6).
- An exit questionnaire captured learners' feelings and views after the intervention (Appendix 7).
- The same process was followed with a small group to examine the effect of the strategies within a group situation.
- The project lead then demonstrated the strategies in several classes. The class teacher was able to continue to utilise the strategies and techniques.
- The strategies were also employed in one-to-one sessions.

Professional learning: Evidence of changes in teaching, learning and assessment practices

The process of completing the action research has had a notable effect on the teaching, learning and assessment practices of all members of the team. By working collaboratively with learners, the strategies developed had a much more impactful result, as the learners themselves were able to articulate what it was they needed and select from a suite of mechanisms and strategies that they could trial themselves. The feedback from learners was extremely positive and, because they were involved in the process and had ownership of the strategies, they were much more engaged. This sensitivity to capturing authentic learner voice and being influenced by it has been a strength of the project and something that will be further developed within the department.

The project lead, having a science and maths background, was very outcome focused and wanted to know the reasons why the strategies worked. Initially the project lead wanted all findings to be proven and to include control groups. This tightly controlled approach was suppressing the natural evolution of the project and restricting the action research, which is a valuable process in its own right because teachers and learners are given more ownership and encouraged to be responsive in terms of what is making a difference for them.

Working with a mentor allowed the project lead to be more reflective and this created opportunities that may have been missed had they taken the purely scientific route.

The benefits of following an action research model have allowed the project lead, an experienced maths teacher, to be open to trying new ideas and working more collaboratively with learners.

Evidence of improved collaboration and changes in organisational practices

The project lead is also the head of department and is used to observing colleagues as part of their role. The action research model allowed the project lead to work more collaboratively with staff and demonstrate the strategies to classes. This was a valuable way of working and one that the department will adopt as a positive way of working together. This peer-to-peer delivery allowed the class teacher to see the strategies working in his own classroom. Seeing his learners react so positively to the strategies has encouraged him to adopt them in all lessons. In a similar way, the one-to-one teacher was also able to observe and then adopt the strategies.

Seeing how enthused both the project lead and the learners were was infectious and motivated other members of staff to buy in to the project.

Evidence of improvement in learners' achievements, retention and progression

Learner feedback was positive throughout the project with learners completing the six-week one-to-one programme commenting as follows:

"I used to feel quite lost but now I actually do understand [Functional Skills maths questions]. I feel that if I saw them in an exam, I would get the answer; whereas before I didn't." (DS)

"Underlining helps me see the maths and ticking helps me break it down – it's not such a big issue for me" (PL)

Learners stated they had increased confidence in topics they previously couldn't answer. In PL's final session she said:

"When I went to my lesson last week, I didn't even ask for help. I was doing my ticking. I got all of them right. I didn't need to ask for help but I do still need a bit of reassurance." (PL)

She was working on percentages which was a topic she mentioned as one that challenged her.

Learners who experienced the strategies in the class situation were equally as positive:

"Ticking off helps you know what you've done - you don't add things twice" (CP)

They feel that their knowledge will go with them into the exam:

"I feel like I won't feel nervous when I go into the exam – I feel like I've done a lot more questions." (DS)

This learner was originally referred to the project as they were struggling to pass. After the six sessions, they passed their Functional Skills exam.

One learner in a classroom setting really identified exactly why the strategies helped him.

"[It] simplifies the question – turns it into maths instead of English in my head. So many words – for me I need to turn the words into maths – this really helps. Ticking stops you forgetting – I can say to myself - hold up a second have I done this bit?" (OK)

The strategies were demonstrated to two classes and, interestingly, the learners were more responsive in the class where the project lead had previously taught several learners. The learners who had not met the project lead before were more discriminating of the strategies but ultimately saw their value.

For some learners the strategies gave them a focus, something to work towards. The strategies broke the problem down:

"The method helps – it makes sense – stops you doing it twice. Plus, it's a relief you've done it." (KM)

The majority of learners increased their scores and went on to pass the Functional Skills exam. Some learners had been failing repeatedly so this was a milestone for them in their college career.

The learners were enthusiastic about their one-to-one sessions and could see the value of the project. There was only one instance of absence over thirty-six sessions and the learner was quick to rearrange a new session. One learner admitted they had not wanted to pass as they were scared of going onto GCSE and the challenge increasing further. Having passed their Functional Skills Level 1 exam after two years of trying, they are now working with their class teacher on GCSE concepts and have said:

"I'm going to give it a go and smash it." (CH)

The learners also began in a small way to start to see the need for the words in the question. The class teacher worked closely with learners to explain the need for contextualisation within the question:

"The response after they've answered the question is that it was a lot easier than they thought and why do they have to use so many words. I've always explained that that's how maths is in real life; rather than just being asked what 15×24 is, it might be there are 24 plants in a row and 15 rows so how many plants are there altogether?" (MW)

Learning from this project

The strategies and mechanisms were successful because they came from the learners. The project lead and teachers involved acted as facilitators to enable the learners to recognise what they found difficult and what would help them. As they were so heavily involved, this had the greatest benefit. Teachers as professionals naturally want to 'teach', but in this process, the teacher needs to facilitate, coach and enable.

Teachers involved in the project not only utilised the strategies but, in some cases, further developed them in collaboration with learners:

"I've tried to get them to not skip the long-worded questions that they see as difficult by covering up the question with a mini whiteboard and then revealing the question line by line (less daunting) and then underlining the key information as you did. Then exactly as you did it, write down the maths to be done, do the maths and then tick off the parts of the question answered afterwards."

The one-to-one teacher observed a definite increase in confidence but highlighted the fact that the strategies are a tool. Without a fundamental knowledge of the core concepts the question is still insurmountable.

"It seems that when the students are focussing on the key information, they are more able to break it down into manageable steps rather than if they just take the question as a whole. Using this method appears to give them more confidence as, to them, they're making the question easier in a way. Although some students can underline the key information, it still doesn't help them as their conceptual knowledge is weak e.g., adding side lengths to find area. As long as they have a sufficient understanding of how to 'do the maths' then using this method seems to help answer longer and more confusing worded questions."

The project was a success because those taking part were able to be sensitive to learner voice and there was a real emphasis on digging deep to discover what the learners needed rather than having a pre-conceived recipe for success.

Our aim was to discover where the barriers were in answering Functional Skills maths questions and to develop strategies to overcome those barriers. We have not only found ways of doing this but have also given the learners increased confidence and resilience when tackling Functional Skills questions.

Appendix 1 – The project team

Project Role	Name	Job Role
Project Lead	Claire Ashworth	Head of maths and English
Deputy Lead	Mark Worrall	Functional Skills maths teacher
Project team	Namier Baythoon	One-to-one teacher
Project team	Sharon Wright	Maths teacher
Project team	Gilda Clark	Maths teacher
Project team	Joseph Thursby	Maths teacher
Project Mentor	Kirsty Powell (ccConsultancy)	
Research Group Lead	Tricia Millar (That Reading Thing)	

Appendix 2 – Sample of initial questionnaires

Student One

CH

What happened in school that didn't work for you?

Maths at school was horrible. I hated ratio and learning my times tables. I did Entry 3 and passed. I can't do worded questions as they are too long. I get area and perimeter mixed up. Or I just add them and don't add all the numbers.

Which parts of maths can you do?

Addition and subtraction without borrowing, division if I draw it, fractions as long as they are not massive – as long as it doesn't say how much is this. I am good at questions about weighing.

I can name some angles but not all of them. I can do all graphs apart from reading pie charts.

What do you think the teacher needs to do differently?

If it's a worded question break down the worded and do it step by step. If it's a paragraph I freak out. It's too much maths at the same time. It's all worded questions. It doesn't help that I have a 'mental breakdown' on the exam because of the pressure.

Is there anything you think you need to do differently?

Not really, not right now. Probably read them a bit slower.

Student two

PL

What happened in school that didn't work for you?

I had a 1:1 in primary school but when I got questions wrong, she was horrible so I developed a negative attitude to maths. At high school I had extra help but there still wasn't enough support and I just didn't retain things.

I struggle with: half my times tables, telling the time, really big questions – really confusing words, a two-part question, I can't read tables, percentages and fractions.

Which parts of maths can you do?

A little bit of times tables. I think I can do stuff but I can't think of what it is. When it's in front of me I know how to do it. I can do some algebra.

What do you think the teacher needs to do differently?

Mark's doing everything right. They need to understand how I work. With questions try to find a way to make me understand.

Q: How do you think you work? I ask a lot of questions, I need reassuring, if there's a really wordy question, I need the big words to be put in simpler form.

If there's a question on the board and I don't get it I just zone out because I don't understand it.

What do you think you need to do differently?

I need to talk less and listen more.

Student four

PB

What happened in school that didn't work for you?

Every time I went into maths, I hated it. It went in one ear and out the other. It didn't work for me at all. I struggle with explaining it, showing my working. Word problems.

Which parts of maths can you do?

Mean, mode, range and median.

What do you think the teacher needs to do differently?

No, Mark is good – he really helps me with it.

What do you think you need to do differently?

Most of the time you go in positive but it beats you down and you can't be bothered.

Appendix 3 – Sample set of questions

OLTA Project questions Week 3

1.

I am planning a party. I have booked the local Scout hut for the party. I am inviting 50 guests.

My guests arrive at 8:30pm. I need to do the following:

Set up the hall – 40 minutes

Bake the food – 1 and a $\frac{1}{4}$ hours

Collect my friend from her house – 20 minutes (must be after 7pm)

Decorate the hall – 1 hour 45 minutes

What time do I need to be at the hall to ensure I can do all these things?

2.

A local catering company is offering a deal. They have 20% off a total package.

The package comprises of:

Basic cost £75

Cost per head £10 (cost per person)

Delivery £25

I want to order enough food for 50 people. How much will I pay?

Appendix 4 – Transcript from session

Week 2 Identifying strategies CH

(Original questions used are copyright protected)

This learner was attempting to answer a question which required him to work out the cost of a trip to the garage. He was required to add four tyres, a service charge and a new battery. He then had to calculate and apply a 20% discount.

Project lead: You read the question first

CH: Oh God, I can't do it

Project lead: Let me read it.

CH: Slightly better, but I feel confused.

Project lead: Okay, shall we start then.

CH attempts problem but missed out the fact that there are 4 tyres to purchase.

Project lead: What could we do to make sure you don't miss things?

CH: I need to underline all the maths.

CH underlined the maths in the question.

Project lead: What have you missed?

CH: I don't know.

Project lead: Go through each of the things you have underlined.

CH: Oh, it says each – does that mean it's one tyre?

CH: So, I need to add three more tyres on.

CH added the three extra tyres on. He worked out 20% discount well with a calculator.

Week 2 Identifying strategies PL

This learner was calculating the time she would leave for a party in France. She needed to add various times together and calculate when she would need to leave the UK. There were 5 different pieces of information embedded in the question.

PL: So much information. Fractions and brackets put me off!

PL read the question.

PL: there are a lot of steps with time which I can't do.

Project lead: Can you just highlight the important bits – some of this question we don't even need.

PL highlighted the maths.

Project lead then read the question.

PL: That's a bit better but still a lot to take in.

Project lead: How would you start this?

PL: I don't know. I'm not normally good at adding things in my head.

Project lead: What if we add one thing at a time and kept a note of what we have added? You could tick the things off as you do them. That way there is only one sum at a time to keep track of.

PL then added each step and kept a note of what the totals were. She ticked off each thing she had added up. I demonstrated how to use fraction pies as a way to add 45 minutes and 15 minutes together. (see appendix 3)

PL: Normally I would be stressing out. If it's harder you have to do it in blocks.

Week 3 Developing strategies

1.

I am planning a party. I have booked the local Scout hut for the party. I am inviting 50 guests.

My guests arrive at 8:30pm. I need to do the following:

Set up the hall – 40 minutes

Bake the food – 1 and a $\frac{1}{4}$ hours

Collect my friend from her house – 20 minutes (must be after 7pm)

Decorate the hall – 1 hour 45 minutes

What time do I need to be at the hall to ensure I can do all these things?

FA: Oh, my goodness it's long. There's a lot of steps there and I will probably miss them.

Project lead: What could we do to make sure you don't?

FA: Oh yes, I can tick off each thing I do. I need to highlight first.

Florina highlighted all the timings, the start time and 50 guests. The project lead did not correct the highlighting of 50 guests.

F.A: Okay I need to look for the easy hours? (Numbers that add to make an hour)

FA added $\frac{1}{4}$ of an hour and 45 minutes together. She ticked these off. She then added 20 minutes and 40 minutes together. These were also ticked. She then added the two remaining hours and ticked these off.

FA: So, four hours. So 4:30pm?

Project lead: Yes. Did the ticking and highlighting help?

FA: Yes, it helped me remember what I had done and helped me find what I needed to do too.

Project lead: You said it was a long question – did it help with that?

FA: Yes, I didn't see the whole problem anymore – just each stage.

Appendix 5 – Student work showing strategies

OLTA Project question Week 3

1.

I am planning a party. I have booked the local Scout hut for the party. I am inviting 50 guests.

My guests arrive at 8:30pm. I need to do the following:

Set up the hall – 40 minutes ✓

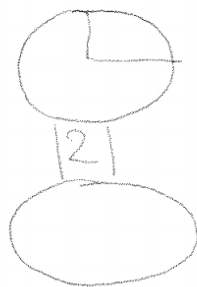
✓ Bake the food – 1 and a ¼ hours

Collect my friend from her house – 20 minutes (must be after 7pm)

✓ Decorate the hall – 1 hour 45 minutes

What time do I need to be at the hall to ensure I can do all these things?

$$1 \frac{1}{4} \text{ hours} + 1 \text{ hour } 45 = \textcircled{2\text{h}}$$
$$\textcircled{40 \text{ mins} + 20 \text{ mins} = 60 \text{ mins}} \rightarrow 2\text{h } 60\text{ mins}$$



$$= 3\text{h} + 60\text{ mins} = \underline{4 \text{ hours}}$$



20 mins
be
After
I

Time starts 4:30

2.

A local catering company is offering a deal. They have 20% off a total package.

The package comprises of:

Basic cost £75

Cost per head £10 (**cost per person**)

Delivery £25

I want to order enough food for 50 people. How much will I pay?

$$\begin{array}{r} -100(600 \\ -20(300 \\ \hline 480 \end{array}$$

$$10 \times 50 = 500$$

+

$$\begin{array}{r} 500 \\ 45 \\ 25 \\ \hline 600 \end{array}$$

2600

$$\begin{array}{r} 3 \\ \cancel{2}600 \\ - 120 \\ \hline 480 \end{array}$$

OLTA Project question Week 3

1.

I am planning a party. I have booked the local Scout hut for the party. I am inviting 50 guests.

My guests arrive at 8:30pm. I need to do the following:

Set up the hall – 40 minutes ✓

Bake the food – 1 and a ¼ hours *1hr 15mins*

Collect my friend from her house – 20 minutes (must be after 7pm) ✓

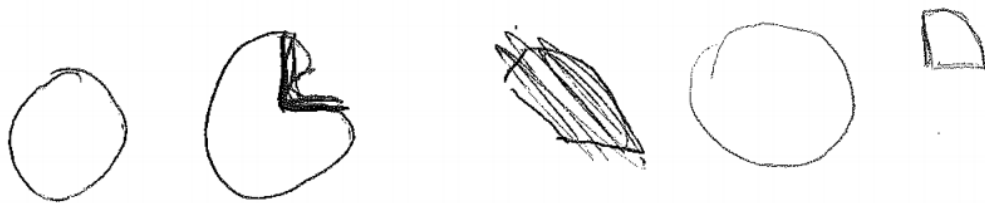
Decorate the hall – 1 hour 45 minutes ✓

What time do I need to be at the hall to ensure I can do all these things?

$$1 \text{ hr } 15 + 1 \text{ hr } 45 = 3 \text{ hrs.}$$

$$40 + 20 = 60.$$

4:30 start.



2.

A local catering company is offering a deal. They have 20% off a total package. ✓

The package comprises of:

Basic cost £75 ✓

Cost per head £10 (cost per person) ✓

Delivery £25 ✓

I want to order enough food for 50 people. How much will I pay? ✓

$$50 \times 10 = \text{£}500 \quad \text{Cost per head.}$$

$$\begin{array}{r} 75.00 \\ 25.00 \\ \hline 100.00 \\ 1 \end{array}$$

$$\begin{array}{r} \cancel{600.00} \quad 10\% \\ 60.00 \\ 60.00 \\ \hline 120.00 \end{array}$$

$$\begin{array}{r} \cancel{500.00} \\ - 120.00 \\ \hline 380.00 \end{array} \quad \text{£}480.00$$

Appendix 6 – Maths only questions

This was in response to learners realising that their maths was actually quite good. One learner asked if they could do the question without so much language to see how they got on. The majority of the learners found this much easier and answered all or nearly all questions correct. The questions followed the same format as the word problems in each session. Upon reflection these questions may have been better distributed at the start of the six weeks.

OTLA project week 5

1.

- a) Add together 15 minutes and 45 minutes _____
- b) Now add that to 2 hours – what do you have _____
- c) Add one and a quarter hours to one hour 45 minutes. _____
- d) Take four hours off 11:35 _____
- e) Add 3 hours on to 2:25 _____

2.

- a) Work out $£80 \times 4$ _____
- b) Add this to £13 and £29 _____
- c) Work out 10% of your answer to b) _____

Appendix 7 – Completed exit questionnaires

Week 6 questions: (DS)

Have the sessions been helpful?

Yes

Can you explain how? What has been the most helpful?

Working out how to answer the questions, they are quite wordy. Before these sessions I probably wouldn't have answered them but now you have talked through them I actually understand them.

3. How do you feel when you see a word problem now?

I used to feel quite lost but now I actually do understand them. I feel that if I saw them in an exam, I would get the answer whereas before I didn't.

4. Has your confidence improved?

Yes definitely.

5. How will this affect you in an exam?

I feel like I won't feel nervous when I go into the exam – I feel like I've done a lot more questions.

6. Do you think it is the 1:1 that has helped or the new strategies of how to solve word problems?

I think it's both but I do think it's how you've taught it to me in the 1:1 sessions.

Week 6 questions: (CH)

1. Have the sessions been helpful?

Yes, it boosted my confidence in maths.

2. Can you explain how? What has been the most helpful?

Knowing the methods (strategies) and how to get round worded problems.

3. How do you feel when you see a word problem now?

More confident and I can give it a go.

4. Has your confidence improved?

Yes (see earlier answer).

5. How will this affect you in an exam?

I still get freaked in exams.

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This programme is funded by the Department for Education.

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157–197 Buckingham Palace Road,
London SW1W 9SP

020 3740 8280

enquiries@etfoundation.co.uk

ETFOUNDATION.CO.UK

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