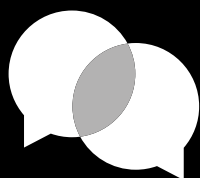


RESPONSIVE TEACHING

AN INTERVENTION FOR FE MATHS PRACTICAL CLASSROOM BOOKLET



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Please scan this QR code to access resources on the Padlet referred to throughout this booklet.

Thank you for doing your bit on behalf of the whole FE maths sector

By doing this intervention you are contributing to the FE Sector's knowledge of what works well in the unique context of FE maths resits as well as improving your learners' experience and progress in FE maths by taking this opportunity to reflect on and develop your own practice.

Summary

This booklet is a practical guide to help plan, prepare and have in your classrooms while trying out a six-week intervention. This intervention was first developed by a group of GCSE maths resit teachers in Further Education colleges in England through action research projects from 2020 to 2022. Then, a larger number of maths resit teachers and learners tried out and evaluated the intervention, to inform the wider FE maths sector and possible future DfE initiatives for FE maths, nationally.

The booklet describes an intervention which may mean introducing something new into your usual teaching practice. Like other teachers who've already tried this intervention, you can integrate it into your existing planning, and make and share adaptations that suit your learners. The intervention is made up of a coherent series of short and focused teaching and learning activities and approaches over a six week period:

Week 1 and 6 are when learners' attitudes and performance are measured using questions provided.

Weeks 2 to 5 are a set of short activities and/or approaches to do with your GCSE maths resit learners.



This booklet is one of many resources produced from several years of research and development by FE maths teachers participating in Centres for Excellence in Maths (CfEM). CfEM is a five-year government-funded improvement programme aimed at delivering sustained improvements in maths outcomes for 16 to 19 year olds, up to Level 2. Discover more CfEM resources and evidence at ETF Maths webpages.

Overview of the intervention

The intervention is an approach to Responsive Teaching. The following pages summarise what you could do each week and has links for the necessary resources. The intervention was designed for 16 to 19 year old maths resit learners and face-to-face delivery.

Rationale

Many maths learners in FE arrive with prior knowledge and entrenched misconceptions. Some of these misconceptions will persist or return after you teach the content again.

This intervention aims to address some of the most persistent misconceptions that resit learners have to do with Ratio, Fractions and Proportion. These three topics are key to success in GCSE and Functional Skills qualifications and are usually taught early in the Autumn term. The intervention can be used for ongoing learning checks if teaching these topics to resit learners for the first time. It can also be used for retrieval and interleaving of these topics if you have already taught them. Importantly, the interventions include time to check what students have learned and address remaining misconceptions directly.

Evidence for the intervention idea

Recent research by groups of maths teachers led by Leyton Sixth Form College and Tameside College over 2 years have fed into a practical approach that can be implemented by other FE maths teachers. This research suggests that a responsive approach to teaching can help learners to recognise misconceptions and improve learning.

Diagnostic questions are used to inform which misconceptions teachers should focus on. Learners address the misconceptions directly by discussing and giving feedback on anonymous work in pairs and then address their own misconceptions through collaborative problem-solving with deconstructed questions.

Introduction to the intervention

Watch the short video available on the Padlet (see Page 2) which will enable you to effectively facilitate the activities and give you some tips. It will also advise you of when in the lesson to carry out the activity or approach.



Timeline and support

The research that took place in Autumn 2022 followed the timetable below, though teachers doing this intervention after this date can do it at any suitable time of year.

Autumn term	Half term 1	A. Induction	• Watch this short introductory Responsive Teaching intervention video (Available on the Padlet). • Planning discussion with a colleague.
		B. Training	• CPD: Watch Session 1 and Session 2 videos (Available on the Padlet).
	Half term 2	C. Intervention	• Week 1 Baseline measures • Week 2 Introduce diagnostic ratio questions. • Week 3 Paired discussion activity on ratio questions and diagnostic activity on fractions questions. • Week 4 Paired discussion activity on fractions questions, diagnostic activity on proportion questions and introduce a de-constructed exam question. • Week 5 Paired discussion activity on proportion questions and de-constructed exam question practice. • Week 6 Follow-up measures.
Spring term	Half term 1	D. Reflection	• Reflect on what worked well and you'll continue. Share with colleagues. For example, in January.

If doing the intervention in the Autumn term, your **Week 1** is likely to be in the same week that November resits end or the one after that. Activities must be done in class time. Ensure you print enough paper maths assessments and questionnaires to give to each of your learners, and the mark scheme – all available on the Padlet. Create unique anonymising codes for the front cover of the assessment and questionnaire only if wanted.

Then, in **Weeks 2 to 5**, you will be able to embed the retrieval process of learnt concepts in all your maths lessons, use diagnostic questions at the end of each lesson to check learning and identify persistent misconceptions, and a paired discussion activity at the start of the next lesson to help the retrieval process. All resources are on the Responsive Teaching intervention Padlet (log-in email CfEM@etfoundation.co.uk password CfEM2022). At the end of this document is space for weekly reflections/notes to record to record what you did and what worked/didn't.

In **Week 6**, learners should complete the follow-up measures, so that results can be compared with the Week 1 baseline. Again, this must be done in class time to ensure independence, pastoral support and high completion rates.

Note: Teachers taking part in the research in Autumn 2022 received an online questionnaire to feedback their experiences and views on the effectiveness of the intervention. This gave invaluable insights on how well the intervention worked and how it could be improved. Independent researchers published anonymised and aggregated findings in March 2023.

Week 1

Baseline measures: maths assessment and attitudinal questionnaire (50 mins)

Introduction

By now, you'll be aware that there are two baseline measures for all your 16-19 year old maths resit learners and that these are available on the padlet along with all other intervention resources:

1st a paper-based maths assessment, with approximately 10 GCSE-type questions of varying difficulty on fractions, ratio and proportion.

2nd a short questionnaire that mainly focuses on their attitudes to learning maths.

Before starting, plan when in Week 1 to do both these baseline measures. In Week 1, please give learners the maths assessment first and the attitudinal questionnaire second. This is because there is a question in the attitudinal questionnaire that asks about their experience of doing the maths assessment. Both baseline measures can be used as learning opportunities.

Note that the same approach to data collection is used in Weeks 1 and 6.



Activity

Inform all learners about the research (10 mins). For example, you could say that you are taking part in some research which involves trying out a new approach in your teaching. You'd really like their help! The aim is to find out how well that approach works. Tell your learners that they have the right to opt out of participating in this research at any time and be ready to provide alternative activities just in case.

Baseline maths assessment (30 mins). After informing all your learners about the research and giving out the unique identifier codes, please ask them to complete the maths assessment. Papers are expected to take approximately 30 minutes (there is no strict time limit). Review the scripts by looking for methods and mis-concepts in workings out and skipped questions as well as marks.

Baseline attitudinal questionnaire (10 mins). Ensure you print enough paper maths assessments and questionnaires to give to each of your learners, and the mark scheme – all available on the Padlet. Create unique anonymising codes for the front cover of the assessment and questionnaire only if wanted. To re-iterate, the questionnaire should be completed by learners in class, face-to-face with you. This is to motivate and support learners to complete the task, independently. Please do not ask learners to do the questionnaire in their own time or remotely.

Supervise their completion of the questionnaire. Each individual learner should complete their own questionnaire. The questionnaire has approximately 15 questions. It is expected to take 10 minutes but there is no strict time limit. The questions are about the learners' confidence and experience of learning maths, in general. Teachers must not answer questions for learners or suggest answers but can help with question comprehension.



Week 2

Setting the scene: Diagnostic ratio questions

Introduction

It is important to set the scene this week. Introduce the diagnostic process. This week the focus is on ratio questions. Students attempt them with a view to paired discussion activity in the next lesson. Please choose 5 out of 10 available questions to suit each of your classes. Make sure you have taught the skills required for each question previously.

Preparation

- Download the PowerPoint slides from the Responsive Teaching intervention Padlet. It is a CfEM Padlet so please log in with the following details: Email: CfEM@etfoundation.co.uk Password: CfEM2022.
- Take a quick look through the test questions on the Padlet (link above) and make sure you've taught all the skills that are being tested, because this project is about dealing with misconceptions that persist AFTER teaching.
- You may want to print the 5 slides so you can see the students written working. Click to print full page slides and then in your printer settings choose 2 per page.

Activity

Starter: Give students the Week 2 test - see Padlet. Insist that the students are not finished until they have a) answered every question and also b) written some workings and/or explanation for each question. The test probably won't take more than 10 minutes but if you want you could give them 15 minutes so nobody's guessing or rushing it. Collect in the test including any workings.

After the lesson, analyse the results after the lesson using the Teacher Notes for each question on the same Padlet. You'll pick one or two focus questions for the discussion next week. The students will answer the diagnostic questions on ratio from their own versions of the slides. Each multiple-choice answer leads directly to a recognised misconception. Learners are encouraged to show their workings and reasoning for their answers and how they arrived at their answers.

Examples of suggested ratio questions and extract of ratio assessment in the resources:

Tom shares some money with his brother in the ratio 5:4. If Tom gets £45, how much does his brother get?

£25 £28 £36 £180

Provide an explanation as to why you selected your answer.

What is the ratio of triangles to squares?



- a) 3:7
- b) 3:4
- c) 4:3
- d) 7:3

Provide an explanation as to why you selected your answer.



Week 3

How to give good feedback, responsive feedback and fractions diagnostic

Introduction

In Week 3, you are going to build on your students' discussion and feedback skills. There are two activities to do with each of your 16-19-year-old GCSE maths resit classes. Both rely on some lesson preparation.

Preparation

- Mark the tests
- Analyse the results and choose just one* focus question
- Create some anonymous work by copying the best explanation and workings you can find for the most common misconception
- Organise your class list into two groups as before to help you set up the mixed pairs
- Bring sticky post-it notes or A3 paper, markers and blu-tac for sharing the feedback

*If the test results are very poor you can do two focus questions and do the process twice but that might mean you go over 30 minutes. Decide for yourself if you want to spend an extra 10-15 minutes on this instead of new content.

Activity 1

As the class come in, use your lists to seat them in discussion pairs where one partner did fairly well on the test and one did less well. If you end up with a pair where neither student did very well make sure you spend time with that group during the discussion.

Introduce this task by explaining that they will be both reviewing a couple of tricky questions from last week's test and also they will be learning how to give feedback, an important skill in any career path where you might end up managing someone.

Discuss with the learners how to give good feedback. Some key qualities of good feedback:

- **Kind:** the feedback recognises what went well, which helps people to engage with what you're saying.
- **Specific:** the feedback connects to a specific problem so the person can see what needs to change.
- **Helpful:** the feedback tells them how to deal with not only this scenario but could be useful when they are tackling a similar problem in future.





Explain the structure of the discussion – Think, Pair, Share – and give them the first piece of anonymous work you prepared.

Think

2 minutes silence to read and think about what feedback you'd give. What went wrong? How can they fix it?

**Pair**

2 minutes to discuss with their partner

**Share**

1 minutes to write down the feedback for sharing on the board

You need to share the students feedback with the whole class. Ask your learners to write feedback using big pens and large paper (unless you have a visualiser and want to use it with sticky post-it notes. Praise the feedback that is particularly good, saying why you think it will be effective. Then give them a minute to make notes of the feedback they think is most useful before you then give them back their tests.

Activity 2

At the end of week 3, you're going to give your students another 5-question quiz, this one is about ratios and fractions. Again, it takes 10 to 15 minutes. Don't accept tests where students haven't answered every question; insist that they write at least some explanation or workings on each one.

Week 4

Responsive feedback and fractions diagnostic

Introduction

This week, you'll build on your students' discussions and feedback to then develop some higher-level skills with a scaffolded exam question on the same topic. This week relies on the following lesson preparation.

Preparation

- Mark the tests, analyse the results and choose just **one**¹ focus question.
- Create some anonymous work by copying the best explanation and workings you can find for the most common misconception.
- Organise each class list into two groups to help you set up the mixed discussion pairs where one partner did fairly well on the test and one did less well. If there is a pair where neither student did very well, spend time with that group during the discussion.
- Bring paper, markers and blu-tac or post-it notes and a visualiser for sharing feedback.
- Print the scaffolded exam question from the Padlet onto A3 paper or stick to flip chart paper so that students have room to write notes or try things out, etc.

Activity 1

Remind the students about what makes good feedback by putting the relevant slide up. Explain you're going to do the Think, Pair, Share discussion again. Then give learners the anonymous work that you prepared in advance (see above). If you have a visualiser get them to write feedback on a post it note, otherwise use big pens and large paper.

Reminder about good feedback

Some qualities of good feedback:

Kind: the feedback recognises what went well. This helps people to engage with what you are saying.

Specific: the feedback connects to a specific problem so the person can see what needs to change.

Helpful: the feedback tells them how to deal with not only this scenario, but could be useful.

Share the students feedback with the whole class and praise the feedback that is particularly good, saying why you think it will be effective. Then give them a minute to make notes of the feedback they think is most useful before you then give them back their tests. Put the feedback up on the board and say which you like best and what you like about it. Give the students time to make notes about the good feedback.

¹If the test results are very poor you can do two focus questions but that might mean you go over 30 minutes. Decide for yourself if you want to spend an extra 10-15 minutes on this instead of new content.

Activity 2

You are now going to explain to your students that they will be putting what they have learnt whilst giving feedback into practice on an exam question that has been broken down for them so that they do not miss any elements out. Students may need support if they have forgotten any elements such as breaking the ratio down and/or drawing a bar model but they are to be encouraged to work together in pairs to solve each step.

Show the ratio of 38 boys and 48 girls in its simplest form	Draw a bar model of the ratio you have just show in its simplest form
There are two drama groups in a college. In one group there are 36 boys and 48 girls. In the other group $\frac{3}{7}$ths are boys and the rest are girls.	
Using the bar model you have just drawn, you can now work out what fraction of students are boys and what fraction are girls	Say if you think Ann is correct. Explain your answer fully.

There is an additional exam question about 'Kerry' should you require it, also in the PowerPoint.

Activity 3

At the end of Week 4, give your students the 5-question quiz on proportional reasoning that is provided on the Padlet. It should take about 10-15 minutes and hopefully they're used to the idea they have to answer every question and give an explanation and or working for each one.



Week 5

Responsive feedback

Preparation

- Mark the tests
- Analyse the results and choose just **one**² focus question
- Create some anonymous work by copying the best explanation and workings you can find for the most common misconception
- Organise your class list into two groups to help you set up the mixed pairs
- Bring paper, markers and blu-tac or use sticky post-it notes and a visualiser for sharing the feedback
- Print the scaffolded exam question on A3 paper or stick to flip chart paper so that students have room to write notes or try things out etc.

For week 5, again you need to organise your class into discussion pairs where one partner did fairly well on the test and one did less well. If you end up with a pair where neither student did very well make sure you spend time with that group during the discussion.

Activity 1

As in the previous week you need to do following:

- Remind the students about what makes good feedback by putting the relevant slide up and explain you're going to do the Think, Pair, Share discussion again.
- Give them the anonymous work you prepared to feedback on using the Think, Pair, Share process. If you have a visualiser get them to write feedback on sticky post-it notes, otherwise give them marker pens and large paper.
- **Share the students feedback with the whole class and praise the feedback that is particularly good, saying why you think it will be effective.**
- **Then give them a minute to make notes of the feedback they think is most useful before you then give them back their tests.**
- Put the students' feedback up on the board and say which you like best and what you like about it. Give the students time to make notes about the good feedback.

Activity 2

For the exam question(s), use A3 or flip chart paper to encourage lots of notes/trying out of sums. Explain to the students that they are going to build upon what they did last week but this time they are going to work on deconstructing the exam questions themselves. Think about the feedback they have given; what advice were they suggesting to their peers? What questions should they be asking in order to answer the exam question fully? Encourage each student to discuss with partners what questions are required in order to help students get to the overall answer.

² Again, if the test results are very poor you can do two focus questions and maybe not do Activity 2.

There are two exam questions available for deconstructing (as well as already deconstructed examples should these be required). An example of a question and how it might be deconstructed is below:

How much does Mo earn per hour?	How much would Mo earn if he worked 20, 20 and 80 hours?
Mo has a part time job on his last pay slip he earned £155.80 for doing 10 hours work.	
He has a bike that costs £1,300. What is the minimum number of hours that he would have to work in order to earn enough to buy the bike?	
Use what you have worked out to find the minimum number of hours that he needs to work to earn £1,300.	Can you think of another way that you could have worked this out?



Week 6

Follow-on measures: maths assessment and attitudinal questionnaire (50 mins)

In Week 6, please repeat the process that you followed in Week 1 so that all – or as many as possible – of your 16-19-year-old maths learners complete both measures:

1st a paper-based maths assessment, with approximately 10 GCSE-type questions of varying difficulty on fractions, ratio and proportion.

2nd a short questionnaire that mainly focuses on their attitudes to learning maths.

Once learners have completed the assessment and questionnaire, review your weekly reflections and compare the results from Week 1 and Week 6.

Conclude your research by deciding what to teach particular learners next and what worked well enough to continue or adapt in future and share with colleagues.

Key points:

- In Week 6, please remind learners of their unique identifier codes (10 mins) and administer both measures – the follow-on maths assessment paper (30 minutes) and then the questionnaire (10 minutes). Return to Week 1 for details.
- Remember, both measures do not have to be done immediately after each other or in the same lesson, but they do need to be completed in Week 6.
- Compare results from Week 1 and 6, and reflect again on Weeks 2 to 5. Use this evidence to inform your future teaching.

Thank you



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This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and extend across the width of the page. There is a small tab at the top left corner. The background behind the paper is a light purple color.

Teacher reflection/notes

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