

Presented by Dr Rhonda Farkota



Direct Instruction (DI)

Little to Chance — Much to Gain Math Mastery Series

| Professor John Hattie

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Director, Melb Ed Research Institute (MERI) and Associate Dean (Research)

Too often, what the critics mean by direct instruction is didactic teacher-led talking from the front; this should *not* be confused with the very successful Direct Instruction method as first outlined by Adams and Engelmann (1996).

... the underlying principles of DI place it among the most successful outcomes.

Visible Learning: A synthesis of over 800 meta-analyses relating to achievement (2009) pp204–205. Routledge ISBN 10:0-415-47618-6 ...the influences on student achievement – what works best for students



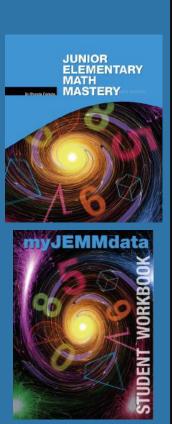
Math Mastery Series

Farkota DI Model for the contemporary Australian classroom

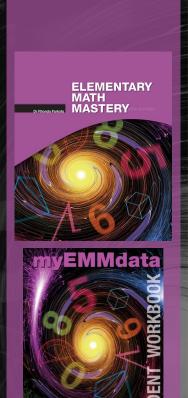
Direct Instruction approach to basic skills fluency and automaticity

Data driven

Teachers: Deliver Diagnose DeBug Students: Record Represent Report





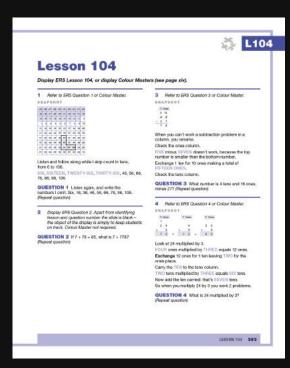


Math Mastery Series



- Orally delivered
- Imparts skills and knowledge in progressive order
- Enables teachers and students to identify exactly where and when students experience difficulty
- Serves as a daily diagnostic tool

| Teacher Script



- No lesson planning
- Teaching built into scripts
- Scripts indicate what you say, do, and display (ERS)
- Snapshots show what students see (ERS) while teacher delivers script

each sentence deliver in small chunks

Electronic Reference Stimuli (ERS)

all visual diagrams, formulas and display material

- Provides effortless visual delivery
- Enhances student engagement
- Aids low-ability students
- Maximises time-efficiency

Question 1

					-30		1934/		0
1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100
101	102	103	104	105	106	107	108	109	110

Question 2

adde	end	+ _	adder 3	nd =	=	sum 10			
1	2	3	4	5	6	7	8	9	10
10	9	8	7	6	5	4	3	2	1
1	2	3	4	5	6	7	8	9	10

Student Workbook

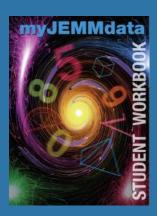
Monitors quality of implementation tracking teacher performance and student achievement

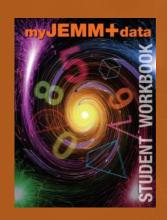
Daily students record, summarise and represent their own data

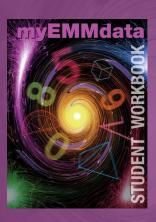
Data driven

Teachers: Students:

Deliver Diagnose DeBug Record Represent Report







Math Mastery Series

- Lessons presented orally
- Auditory processing capacity

...the ability of the child to hold, sequence and process or understand what they have heard

Pollard J., Rowe K. S

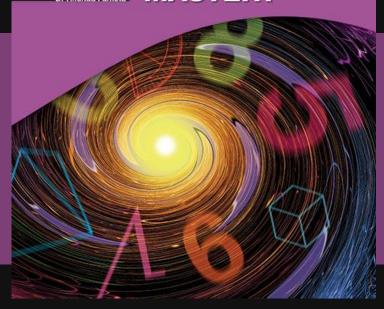
http://auditoryprocessingkit.com/auditory-processing-101.php

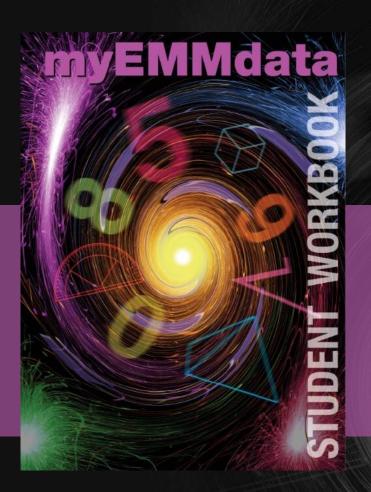
| Math Mastery Series

	Numbe	r of session	s to comple	te MMS
	ЕММ	JEMM+	JEMM	TOTAL
Teacher delivered scripted lessons	160	120	80	360
Student Self-evaluations	8	6	4	18
Marathons	40	30	20	90
EMM/JEMM+/JEMMathon tasks	8	6	4	18
Round tasks	24	18	12	54
Challenges	4	4	4	12
TOTAL number of sessions required	244	184	124	552

Elementary Math Mastery (EMM)

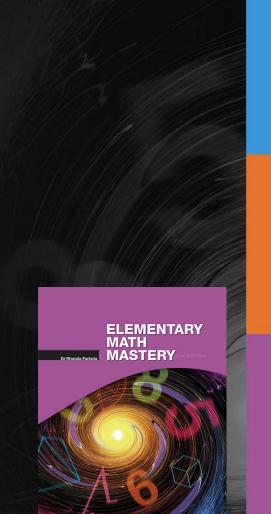
ELEMENTARY MATH MASTERY





EMM

- Ideally suited to upper primary, secondary and remedial students
- Requires 20–25 min daily to implement + 5–10 min for correction and feedback
- 3200 questions
- 160 lessons
- 20 strands each lesson

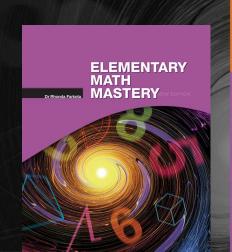


20 EMM Strands

fluency automaticity

- ✓ addition
- √ subtraction
- ✓ multiplication
- √ division
- number patterns
- equations and inverse operations
- ✓ whole number properties
- ✓ fractions
- √ decimals
- ✓ measurement

- √ space
- ✓ geometry
- average, percentage, ratio, chance
- ✓ math language
- ✓ money
- √ time
- √ algebra
- ✓ visual perception
- √ data analysis
- ✓ problem solving



Program Structure – EMM

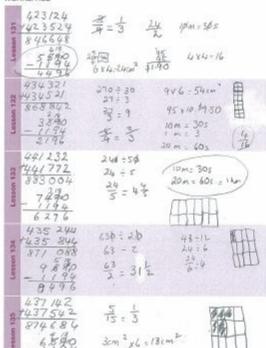
160 lessons starting at base level structured in rounds of five

New concepts introduced in first lesson of round

Last lessons of each round put these concepts to the test



WORKSPACE



For each Lesson the whole of my date to represented in 2 columns. The first column represents Question group 1-10. For this group! colour gods the KEY. Next I fill in the missing latels. Then I shade the column upwards stopping at the number equal to the number of my correct responses. I repeat the process for Queetion group 11-20.

Detw

Round 27

Question 1 Geestion 2

Question 3

Question 4

Question 5

Question 6

Question 7

Question 8

Question 9

Question 10 Question 11 Question 12

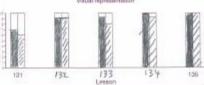
Question 13

Question 14

Question 15 Question 16 Question 17 Question 18 Question 19 Question 20 My score

3-12-12	4-12-12	5-12-12	6-12-12	7-12-12		Bu	pBos	rd		
Lesson 131	Lesson 132	Lesson 133	Lesson 154	Lesson 135	131	132	133	334	135	
846648	868842	883 004	871088	874684	0	0	0	0	0	
4496	2196	6296	8496	5396	0	6	0	6	0	
+	-	0	28 +	(9450)+	0	0	0	0	0	
17	9	4 45	31左	11	0	6	0	6	0	
30	15	9	63	29	0	0	0	0	0	
0	-	_	+	-	0	0	0	0	0	
2	3	5	4	10	0	0	0	6	0	
七	3/3	15	13	43	8	0	8	8	0	
12%	(14)	3,00	5%	9/100	8	8	0	0	0	
(200)	500mL	19	2019	2109	0	0	6	0	6	
6	6	2	a	h	0	0	0	0	0	
(24cm)	54cm2	6cm2	12cm2	13cm 2	0	0	6	0	6	
Tail	Head	2	3	14,1+	0	0	0	0	0	
2	10	3	4	5	0	0	0	0	0	
1 100	40.00		10	10	0	-	-			
3	60sec	0	2 min	1-2km	0	0	0	0	0	
75	6	30	10	Ø.5	-	-	0	-	v	
East	North	Dook!	Northed	SE	0	0	(3)	0	0	
(9,8)	(8,6)	Pond	PGarden	Bulb	0	0	0	8	0	
16	(36)	12	12	5/2	Ð	0	0	0	0	
13	18	17	19	20						
20	20	20	20	20						

Visual representation



SE Questions 1-18 Z. Questions 11-20

go to page 95 and

What bugs you?

- BUG incorrect response where student is unable to understand why they are wrong
- DEBUG directly after corrections
- Do not debug EMM Question 20, JEMM+ Question 15, JEMM Strategic Thinking Units



What bugs you?

.... brilliant teachers identify problems before they happen. And, the debugging process that is used in the Math Mastery Series (EMM, JEMM, JEMM+) is a great example of a timely correction process (see Boyd, MacNeill, & Sullivan, 2019).

DR RAY BOYD AND DR NEIL MACNEILL

EDUCATION TODAY FEB 10, 2023

https://www.educationtoday.com.au/news-detail/Explicit-Instruction-5836

Lesson 21 – Teacher Script

Scripts indicate what you say, do, and display

What you stress is in bold text.

What you say appears in this type.

What you say and simultaneously point at on the electronic display or whiteboard appears in CAPITAL

13 Refer to FRS Question 13.

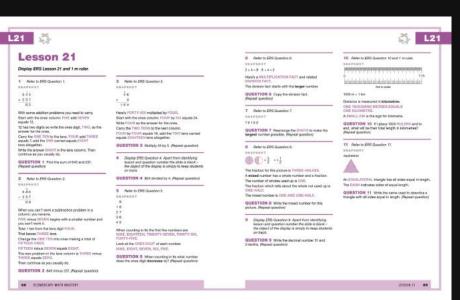
SNABSHOT

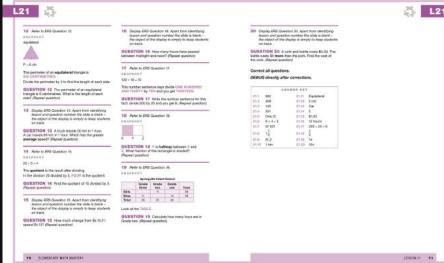
part A 1 square part B

The average tells how many there would be in each part if the total sum were evenly shared. PART A is one part and PART B is the other part.

QUESTION 13 How many parts altogether? (Repeat question)

What you do appears in italics.



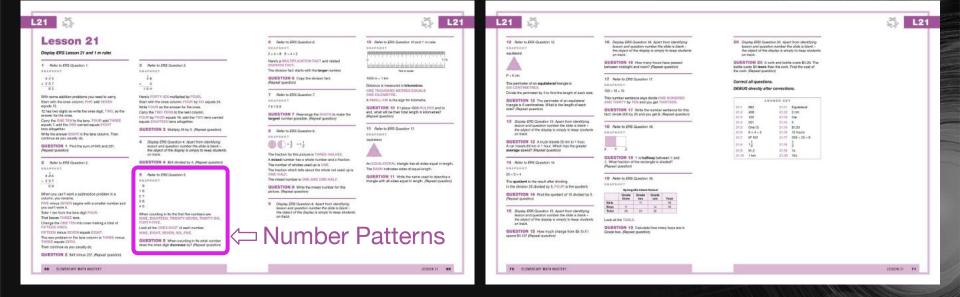


| Number Patterns – Question 5

- 2s countingDivisibility test Application
- ✓ 5s countingDivisibility test Application
- 9s countingDivisibility test Application
- ✓ 3s countingDivisibility test Application
- ✓ 10s countingDivisibility test Application

- 4s countingDivisibility test Application
- 8s countingDivisibility test Application
- ✓ 25s counting Money amounts
- 6s countingDivisibility test Application
- Missing number within pattern

Lesson 21 – Teacher Script Scripts indicate what you say, do, and display



5 Refer to ERS Question 5.

SNAPSHOT

9

18

27

36

4 5

When counting in 9s the first five numbers are NINE, EIGHTEEN, TWENTY-SEVEN, THIRTY-SIX, FORTY-FIVE.

Look at the ONES DIGIT of each number. NINE, EIGHT, SEVEN, SIX, FIVE.

QUESTION 5 When counting in 9s what number does the ones digit **decrease** by? (Repeat question)

Students do not see the teacher's script (shown above). Before reaching this stage of the lesson, the teacher presented sections 1 - 4 (addition, subtraction, multiplication and division).



Strand development – first lesson of Round 5 Section 5: NUMBER PATTERNS introducing 9s – recognise place value (ones)

5 Refer to ERS Question 5.

SNAPSHOT

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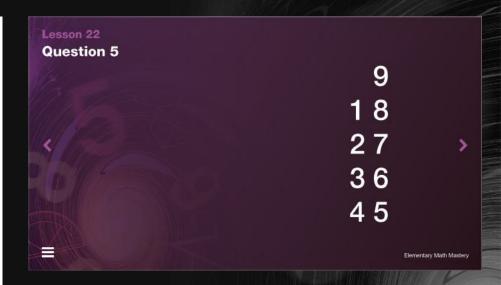
18

2 7

When counting in 9s the first five numbers are NINE, EIGHTEEN, TWENTY-SEVEN, THIRTY-SIX, FORTY-FIVE.

Look at the TENS DIGIT of each number. ONE, TWO, THREE, FOUR.

QUESTION 5 When counting in 9s what number does the tens digit **increase** by? (Repeat question)



Strand development – second lesson of Round 5 Section 5: NUMBER PATTERNS introducing 9s – recognise place value (tens)

5 Refer to ERS Question 5.

SNAPSHOT

1

18

27

When counting in 9s the first five numbers are NINE, EIGHTEEN, TWENTY-SEVEN, THIRTY-SIX, FORTY-FIVE.

QUESTION 5 When counting in 9s the ones digit decreases by 1 and the tens digit increases by 1. When counting in 9s what number comes just **after** 45? (Repeat question)



Strand development – third lesson of Round 5 Section 5: NUMBER PATTERNS Continue 9s pattern

5 Refer to ERS Question 5.

SNAPSHOT

(

18

27

When counting in 9s the first five numbers are NINE, EIGHTEEN, TWENTY-SEVEN, THIRTY-SIX, FORTY-FIVE.

QUESTION 5 When counting in 9s the ones digit decreases by 1 and the tens digit increases by 1. When counting in 9s what number comes just **before** 81? (Repeat question)



Strand development – fourth lesson of Round 5 Section 5: NUMBER PATTERNS Extend 9s pattern

5 Refer to ERS Question 5.

SNAPSHOT

9

18

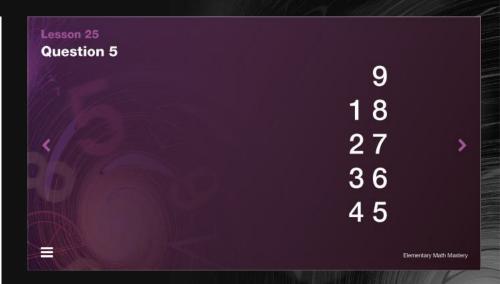
27

3 6

4 5

When counting in 9s the first five numbers are NINE, EIGHTEEN, TWENTY-SEVEN, THIRTY-SIX, FORTY-FIVE.

QUESTION 5 When counting in 9s what number comes just **before** 63, and what number comes just **after** 63 when counting in 9s? (Repeat question)



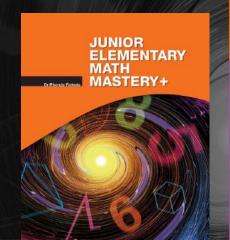
Strand development – last lesson of Round 5 Section 5: NUMBER PATTERNS understanding 9s – put to the test

| 15 JEMM+ Strands

fluency automaticity

- ✓ counting
- ✓ addition
- ✓ subtraction
- ✓ multiplication
- √ division
- ✓ number patterns
- ✓ fractions
- √ decimals

- ✓ measurement
- √ space
- ✓ money
- √ time
- √ visual perception
- ✓ data and chance
- ✓ problem solving

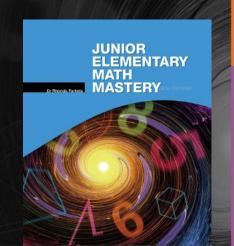


10 JEMM Strands

fluency automaticity

- ✓ addition
- ✓ subtraction
- ✓ number facts
- ✓ place value
- ✓ number patterns
- ✓ money
- ✓ measurement
- ✓ fractions
- √ time
- ✓ data and chance

strategic thinking: a hands-on approach to problem solving



myEMMdata Student Workbook

https://mathmasteryseries.com.au/student-workbook/

Daily Data: Daily, you record and summarise your own data. For incorrect reponses classified as Bugs, you shade the BugKey in the corresponding row on the BugBoard. This allows you and your teacher to monitor your progress.

Visual representation: This provides you with base knowledge and daily practice in reading and interpreting data to prepare you for the Round task.

WORKSPACE

For each Lesson the whole of my data is represented in a bar made of 20 rectangles. From the baseline, I summarise my data by shading the number of rectangles equal to my score.

Question 12
Question 13
Question 14

stion 16

stion 18

tion 20

My score Out of

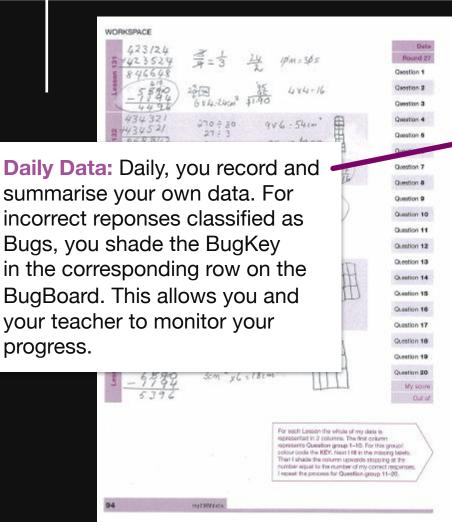


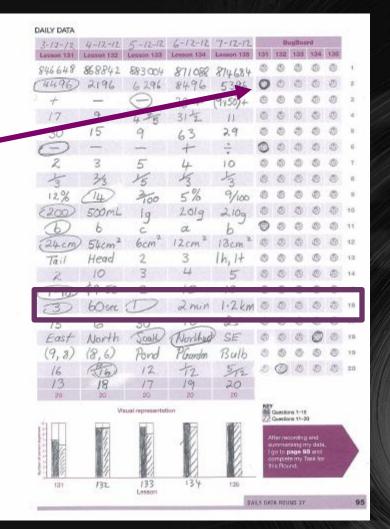
myEMMdata p 2–3

What bugs you?

Feedback originates from the student. When melded with the teachers 'correctional review', feedback becomes a new instruction rather than a mere correction (Kulhavy, 1977). Skilled questioning by the teacher will enhance existing knowledge and 'guide students to thoughtful and reflective answers.' (Samson, Strykowski, Weinstein, & Walberg, 1987).

DR RHONDA FARKOTA (2003); See PROFESSOR HATTIE (2009) Visible Learning pp173-184 Routledge ISBN 10:0-415-47618-6

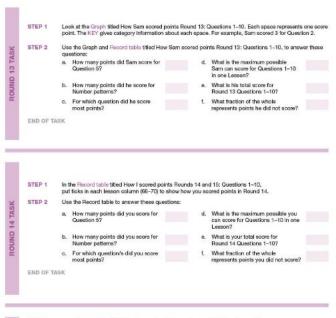




myEMMdata p 52–53

myJEMM+data p 38–39

myJEMMdata p 52–53



STEP 1 in the Record table titled How I scored points Rounds 14 and 15: Questions 1–10, put ticks in each lesson column (71–75) to show how you scored points.

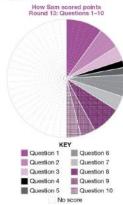
STEP 2 Look at the Graph titled How I scored points Round 15: Questions 1–10. Each space represents one scored.

Round Task: EMM is structured into 32 rounds each consisting of 5 lessons. At the end of each round you read, interpret and complete tables and graphs building on the visual representation knowledge you have acquired.

RECORD TABLE

13								
61	62	63	64	65				
~	~		~	~				
	~			V				
~	V							
			~					
		~						
~	V			V				
			~	~				
	V	~	V	~				
			~	~				
			~	V				
	~	v v v	v v v v v v v v v v v v v v v v v v v					

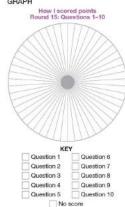
GRAP



RECORD TABLE

Round			14					15		
Leeson	66	67	68	69	70	71	72	73	74	75
Question 1 Addition										
Question 2 Subtraction										
Question 3 Multiplication										
Question 4 Division										
Question 5 Number patterns										
Question 6 Equation and inverse operations										
Duestion 7 Whole number properties										
Question 8 Fractions										
Question 9 Decimals										
Question 10 Measurement										

GRAPH



myEMMdata p 12–13

myJEMM+data p 12–13

myJEMMdata p 12–13

I enter my data in the table on the facing page then complete the Self-evaluation below.

EMM Student Self-evaluation

		Score	Out of	From these scores I make the following	
1	Addition		20	assessment of my progress:	
2	Subtraction		20	My EMM strand of strength is	
3	Multiplication		20		
4	Division		20	because	
5	Number patterns		20		
6	Equations and inverse operations		20	15	
7	Whole number properties		20	The EMM strand I most need to impro	ve i
8	Fractions		20		
9	Decimals		20		
0	Measurement		20	 I can improve my overall EMM scores 	by
1	Space		20		
2	Geometry		20	2	
3	Average, percentage, ratio, chance		20	The amount of effort I put into these	
4	Math language		20	lessons was	
5	Money		20		
6	Time		20	-	
7	Algebra		20		
8	Visual perception		20	 At the moment EMM is making me fer 	el
9	Data analysis		20		
0	Problem solving		20		

Self-evaluation: After each group of 20 lessons you self-evaluate and reflect on your growth in knowledge, understanding and achievement.

My teacher's comment:

MY TOTAL SCORE

Lessons 1 to 20

	Round 1	Round 2	Round 3	Round 4	My score	Out of
Question 1 Addition						20
Question 2 Subtraction						20
Question 3 Multiplication						20
Question 4 Division						20
Question 5 Number patterns						20
Question 6 Equations and inverse operations						20
Question 7 Whole number properties						20
Question 8 Fractions						20
Question 9 Decimals						20
Question 10 Measurement						20
Question 11 Space						20
Question 12 Geometry						20
Question 13 Average, percentage, ratio, chance						20
Question 14 Math language						20
Question 15 Money						20
Question 16 Time						20
Question 17 Algebra						20
Question 18 Visual perception						20
Question 19 Data analysis						20
Question 20 Problem solving						20

MMSanimation

Voice-over with animation: animations reflect that critical part of Math Mastery Series lesson script (shown in coloured CAPS) requiring the teacher to point on the electronic display.

Lesson 21 Question 5

Junior Elementary Math Mastery+

Lesson 1 Question 2

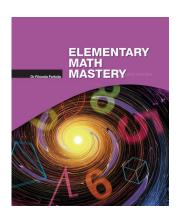
adde 7	end	+ _	ddei 3	nd =		um 10			
1	2	3	4	5	6	7	8	9	10
10	9	8	7	6	5	4	3	2	1
1	2	3	4	5	6	7	8	9	10

Each program, JEMM, JEMM+ and EMM, comprises:

Teacher Book

Contains presentation lesson scripts with exact instructional wording.

JEMM 80 lessons JEMM+ 120 lessons EMM 160 lessons



Electronic Reference Stimuli (ERS)

Includes all visual diagrams, formulas and display material (free download provided with the purchase of Teacher Book).

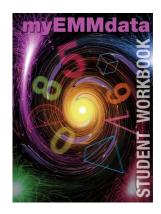
JEMM 680 ERS stims JEMM+ 1800 ERS stims EMM 3200 ERS stims



Student Workbook

An academic journal where students record, analyse and map performance.

myJEMMdata 92 pages myJEMM+data 124 pages myEMMdata 152 pages



MMSanimation

JEMManimation JEMM+animation EMManimation

Voice-over with animation: the animations reflect that critical part of the Math Mastery Series lesson script (shown in coloured CAPS) requiring the teacher to point on the electronic display.

JEMM 680 videos JEMM+ 1800 videos EMM 3200 videos

You can access MMSanimation Lessons 1-10 freely.



Research on Learning

The effectiveness of the Math Mastery Series is dependent on the quality of implementation. Where the quality of implementation is high, and when implemented as prescribed, effective learning is assured.

Teacher Book Introduction and sample lessons: https://mathmasteryseries.com.au/sample-materials/

Implementation Plan: https://mathmasteryseries.com.au/implementation-plan/

Implementation Checklist: https://mathmasteryseries.com.au/implementation-checklist/

Professional Learning Reading Plan:

https://mathmasteryseries.com.au/professional-learning-reading-plan/

Resources to assist the teacher in introducing aspects of Student Workbooks: https://mathmasteryseries.com.au/student-workbook/

<u>MMSanimation:</u> mathmasteryseries.com.au/mmsanimation/ and select **EMManimation** or JEMM+animation or **JEMManimation**

Dr Rhonda Farkota

Monash University

The effects of DI in the regular math class on student self-efficacy and achievement.

http://www.acer.org/files/FarkotaThesis.pdf



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