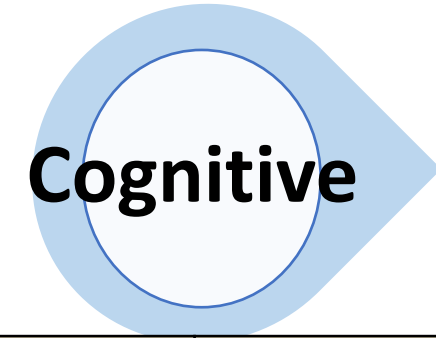




Pilot Study on Building Math Factual Fluency and Self- Regulation

Using Leitner System

INTERNAL FACTORS AFFECTING NUMERACY ACQUISITION



Motivation / Confidence / Self – concept	
<i>Mathematics – related Factors</i>	<i>Non-Mathematics-Related Factors</i>
<ul style="list-style-type: none"> ★ Mathematics Anxiety ★ Experiencing Small Successes (e.g. Achieving Baseline Competencies) 	<ul style="list-style-type: none"> • Presence of positive role models • Teacher – student Relationship ★ Growth Mindset in learners (Having the Try-Fail-Try attitude)

SEL Competencies
<ul style="list-style-type: none"> ★ Learning disposition in class • Resilience to complete assignment, attend school regularly • Ability to work with teachers and classmates

Language Proficiency	Executive functioning
<ul style="list-style-type: none"> • Ability to understand written or spoken instruction • Ability to comprehend math instructions and questions 	<ul style="list-style-type: none"> ★ Ability to retain Mathematics Facts (Factual fluency) ★ Ability to develop procedural fluency ★ Ability to simple solve problem

Current Reality



Many LPL struggle with basic mathematical facts



Students develop fixed mindset beliefs about their mathematical ability



Poor Memory Retention and Lack of self-regulation skills compounds learning difficulties



Achievement gaps continue to widen

What we
hope to
achieve?

Primary Aims

Improve Mathematical Factual Fluency

- P1: Addition and Subtraction within 20
- P2 & P3: Multiplication and Division (2 to 10 times table facts)
- Increase speed and accuracy

- **Develop Self-Regulation Skills**
 - Self-assessment abilities
 - Goal-setting and monitoring through reflection



What Research Tells Us



Students who set their own goals show greater persistence



Students' beliefs about their potential profoundly shape achievement



Self-regulation and growth mindset together create powerful learning conditions

The Leitner System + Self- Regulation

What is it?

Spaced repetition system using flashcards in different envelopes

Block practice first and then Interleaved practice: mixing different types of facts

Students move cards based on their confidence and accuracy

Students learn at their own pace

Built-in self-assessment and progress tracking

Built-in goal-setting and self-reflection opportunities

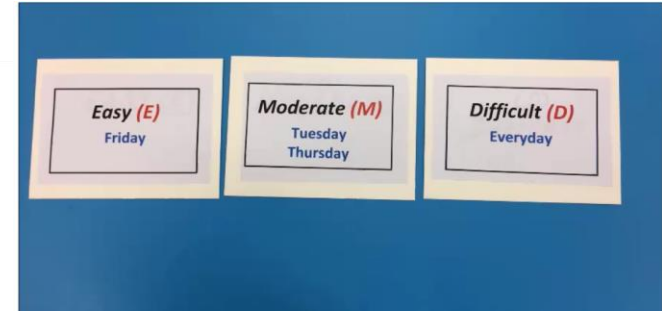
The Leitner System + Self-Regulation

How *it works?*

- By focusing more on the questions that students find difficult and reviewing easier questions less often, this system strengthens students' memory and helps them retain information more effectively over time.
- [Leitner System for Flashcards](#)
- Resources
 - Factual Cards
 - Record Sheet
 - Student Tracking Booklet
 - Practice Booklets

Practice 2

- | | |
|------------------|------------------|
| A) $1 \div 1 =$ | K) $6 \div 2 =$ |
| B) $3 \div 1 =$ | L) $10 \div 2 =$ |
| C) $5 \div 1 =$ | M) $7 \div 1 =$ |
| D) $4 \div 2 =$ | N) $9 \div 1 =$ |
| E) $8 \div 2 =$ | O) $16 \div 2 =$ |
| F) $12 \div 2 =$ | P) $8 \div 1 =$ |
| G) $2 \div 1 =$ | Q) $14 \div 2 =$ |
| H) $4 \div 1 =$ | R) $18 \div 2 =$ |
| I) $6 \div 1 =$ | S) $10 \div 1 =$ |



School: _____ Primary School
 Name: _____ Class: _____

- Instructions**
- Write the date of the day in the first column.
 - After going through all the cards for the day, record the number of cards in each pack.
 - Also write down the **colour** of the cards if there are any changes for the day.

Example

Date	Card Colour	Pack A Everyday	Pack B Tuesday Thursday	Pack C Friday
Monday 12 Jan	Red	6	2	0
Tuesday 13 Jan		5	3	2
Wednesday 14 Jan		0	8	2
Thursday 15 Jan		0	0	10
Friday 16 Jan	Red, Orange	8	2	0

Date	Card Colour	Pack A Everyday	Pack B Tuesday Thursday	Pack C Friday
Monday				
Tuesday				
Wednesday				

Milestone 1 My Tracking Chart

- I can do addition within 10. ★
- I can do subtraction within 10. ★
- I can do addition within 20. ★
- I can do subtraction within 20. ★
- I can do addition and subtraction within 20. ★

The Leitner System + Self- Regulation

*Why it
works?*

Students set personal targets and reflect on progress

Distributed practice improves long-term retention over massed practice

Promotes metacognition and self-monitoring

Builds confidence through visible progress

Develops growth mindset through effort-based advancement

Develops ownership through self-assessment and goal adjustment

How it looks like?



Weekly:



Goal Setting for the week



Daily:



10 min: Leitner System (on factual fluency)



40 min : new content instruction (as per planned by teacher)



10 min : self-reflection

Promoting Self-Regulation Through Target Setting

Example in Achievement Booklet



Students set learning targets at their own pace.



Students write down specific achievement dates for each milestone.

Milestone

1

My Tracking Chart

I can do addition within 10.



Date: 20 Mar 2026

I can do subtraction within 10.



Date: 24 Mar 2026

I can do addition within 20.



Date: 27 Mar 2026

How it looks like?



Weekly:



Goal Setting for the week



Daily:



10 min: Leitner System (on factual fluency)

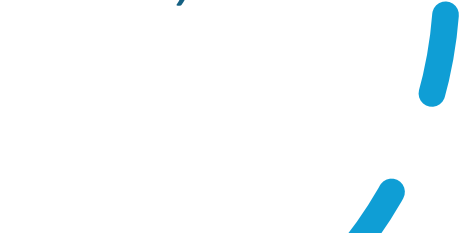


40 min : new content instruction (as per planned by teacher)



10 min : self-reflection

Goal Setting: What Students Will Learn to Do

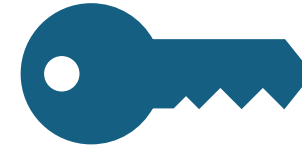
- **Weekly Goal-Setting:**
 - "This week I want to master ___ facts"
 - "I will practise for ___ minutes each day"
 - **Daily Self-Reflection on Growth:**
 - "I have become better at converting fraction to decimal (growth)"
 - *Before* : I used to convert $\frac{1}{4}$ to 1.4
 - *Now*: I convert $\frac{1}{4}$ to $\frac{25}{100}$ to 0.25 (evidence)"
 - "What will I do differently?"
- 

What we want to find out



Timeline for Fluency Achievement

How long does it take low progress learners to achieve factual fluency for each mathematical fact?



Key Factors for Success:

What implementation conditions and routines maximise learning gains?

How do student beliefs and attitudes change over time?

Which students benefit most from this approach?

How does improved factual fluency impact overall mathematical confidence of these students?

Data
Collection

Pre-
Intervention
– Pre Tests

Factual Fluency:

- Addition and Subtraction within 20
- Multiplication and Division Facts

2. Survey for Students

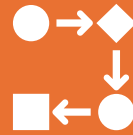
Data collection During Intervention

Weekly log on Leitner System

Student Tracking Chart (based on lesson/topic)

Students' learning videos

Data
collection
Post-
Intervention –
Post Tests



Repeat all pre-intervention
assessments



Interview with students



Teacher report/interview on
students – assessing motivation
and self-regulation behaviours