



MATHSCHECK:

Use of Data from an Online Assessment Tool for Primary Mathematics

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Outline

- Background
- Use of Data
 - Reporting
 - Macro level information
- Concluding Thoughts

Background

What is MathsCheck

- An **online assessment tool** developed with the intent to support schools in **formative assessment**, following the Primary Education Review and Implementation Committee's recommendation for schools to reduce the overly strong emphasis on exams
- It is designed to measure students' performance in **core knowledge and skills in Mathematics at the end of Primary 2**, and to provide **qualitative feedback to schools** for the teaching and learning of young students. This is first extended to Primary 4 in 2017
- In doing so, MathsCheck helps to direct attention particularly to the learning gaps of weaker students for timely pedagogical intervention.

What is MathsCheck

- Qualitative feedback, through **Skill Descriptors**:
 - A skill descriptor is **a statement that describes what students can or cannot manage in terms of core knowledge and skills**
 - The qualitative skill descriptors present **finer granularity of information** (than a numerical score), so that **targeted action** can be taken to improve students' learning.

What is MathsCheck

Topic	Skill Descriptors
Whole Numbers	Recognise place values up to 1000
	Perform 4 operations on whole numbers
	Solve routine problems on whole numbers involving 4 operations
Fractions	Identify and represent fractions
	Perform addition or subtraction on like fractions
	Order fractions
Money / Decimals	Solve routine problem involving money
Measurement	Read time
	Recognise unit of measurements for mass/length/volume
	Solve problems involving measurements
Data Representation & Interpretation	Interpret picture graph
	Solve problem involving picture graph
Mathematical Processes (A)	Solve problems that assess mathematical processes

Quick Information

Test and Administration details

- Instruction by Teacher & Video Explanation
- Familiarisation and Practice
- Test:
 - 1 hour 5 min
 - 55 questions (Multiple Choice(s), Drag and Drop, Fill in the blanks, Ordering, Matching)

Implementation

- Since 2014
- 137 schools participated in total
- 59,050 students participated in total

Use of Data

Use of Data

- While schools conduct class and school tests and examinations, there are **no big data collected on *Assessment for Learning*** at the macro level across schools.
- MathsCheck fills this gap as the data collected span **across schools over time**. The data collected represents a growing data repository which could be analysed for useful information to stakeholders (e.g. schools, senior management).
- Key uses:
 - **Reporting** – making available feedback at student, class, school level
 - **Macro level information** – aggregated information for policy and practice consideration

Reporting

- **Reporting** – making available feedback at student, class, school level
 - Information beyond numerical test scores
 - Qualitative feedback for learning and teaching – for reaffirmation or relevant intervention
 - **Feedback strategies** (Brookhart, 2008)
 - **Score Report Development Model (SRDM)** (Zenisky and Hambleton, 2012)

Feedback strategies:

- *Timing and audience*
 - A **snapshot** of students' performance at the *end of an academic year*
 - maximum curriculum time to complete their learning in their foundation years.
 - Reports given to participating *schools* via the **new class composition** of the following academic year.
 - forward-looking references for *teachers* of the new classes, providing them with information about the learning of their new students.

Reporting

- *Mode and amount*
 - Amount of feedback content in reports
 - **Balance** between **quantity** and **quality** (enough? useful?)
 - **Technical information** vs **understanding of users** (relevant? familiar?)
 - How reports could be disseminated
 - Mode - **written**
 - Layout – **optimal on paper**
 - Form of delivery – **printed** vs **softcopy**

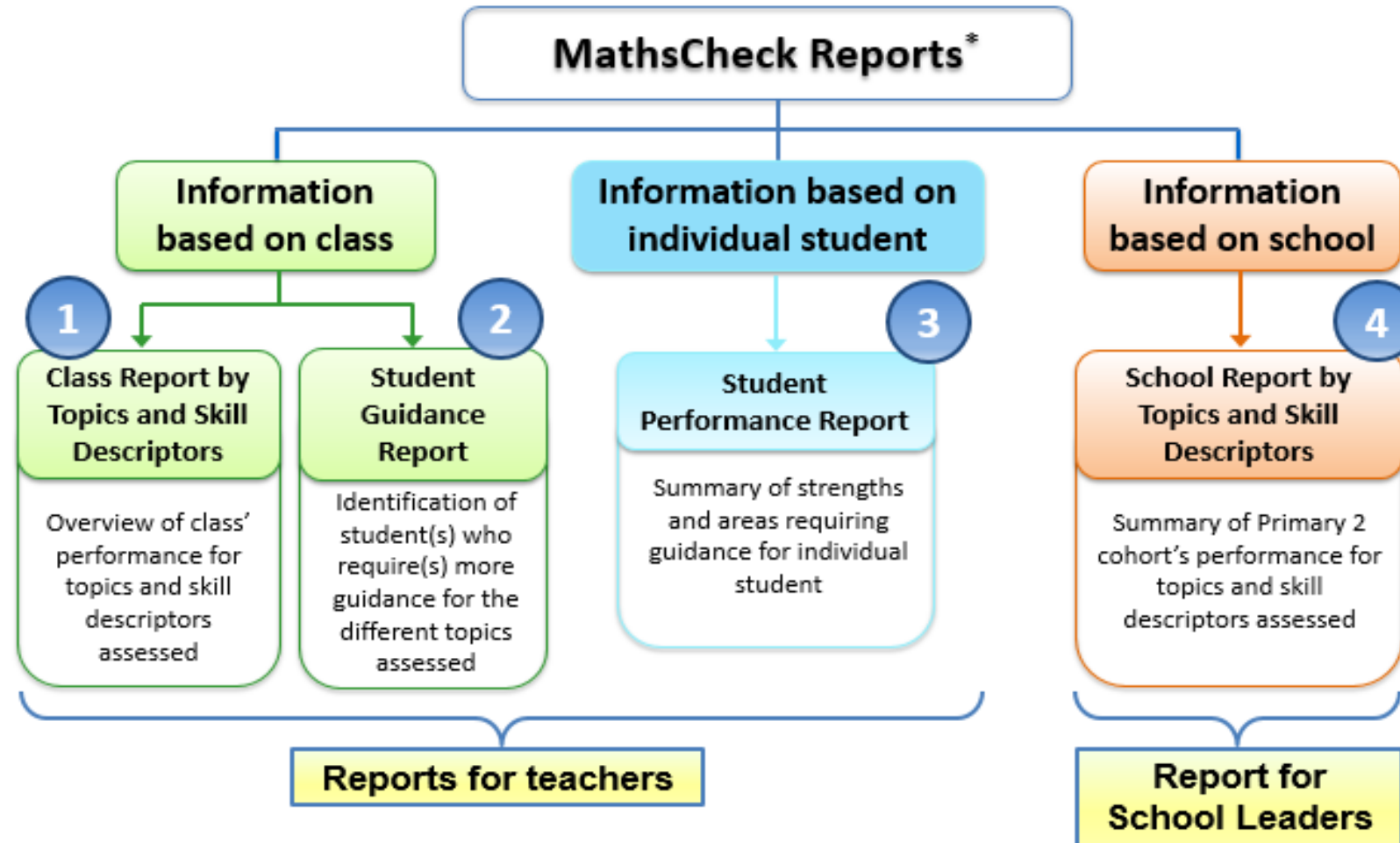
Adapting the Score Report Development Model (SRDM) proposed by Zenisky and Hambleton (2012):

- Defining report purpose
- Identifying intended audience
- Developing prototype reports
- Field testing
- Collecting feedback
- Revising and redesigning



Ongoing review

Reporting



**Reports are provided to P3 teachers, focusing on Assessments in Transitions (from lower to middle primary).*

Sample MathsCheck Reports

For teacher's use

Singapore Mathematics Skills Check (MathsCheck) - P2
Class Report By Topics and Skill Descriptors

P3 Class: H
Size: 40

School: XYZ Primary School
Test Period: Oct/ Nov

By Topics

Topic	No. of students below mean	Mean (%)	Minimum (%)	Maximum (%)
Whole Numbers	13	93	78	100
Fractions	12	88	22	100
Money	9	93	0	100
Measurement	18	36	0	100
Data Representation and Interpretation	16	77	50	100
Mathematical Processes	28	62	0	83

Class Report by
Topics and Skill
Descriptors

Sample MathsCheck Reports

By Skill Descriptors	Percentage of students who can manage
Skill descriptors	
Whole Numbers	
Recognise place values up to 1000	100
Perform 4 operations on whole numbers	95
Solve routine problem on whole numbers involving 4 operations	86
Fractions	
Identify and represent fractions	98
Perform addition and/or subtraction on like fractions	93
Order fractions	90
Money	
Count and/or solve routine problem involving money	100
Measurement	
Read time	79
Recognise unit of measurements for mass/length/volume	70
Solve routine problem involving measurements	30
Data Representation and Interpretation	
Interpret picture graph	98
Solve problem involving picture graph	85
Mathematical Processes	
Solve problem that assess mathematical processes	46

Class Report by
Topics and Skill
Descriptors

Sample MathsCheck Reports

Singapore Mathematics Skills Check (MathsCheck) - P2		For Teacher's Use
Student Performance Report		
Name: Melvin Ang	School: XYZ Primary School	
P3 Class: H	Test Period: Oct/Nov	
Skill descriptors that student can manage	Number of items correct	
Whole Numbers		
Recognise place values up to 1000	3 out of 3	
Solve routine problem on whole numbers involving 4 operations	2 out of 3	
Perform 4 operations on whole numbers	2 out of 3	
Fractions		
Identify and represent fraction	2 out of 3	
Money		
Count and/or solve routine problem involving money	3 out of 4	
Measurement		
Read time	2 out of 3	
Recognise unit of measurements for mass/length/volume	3 out of 3	
Solve problem involving measurements	3 out of 3	
Mathematical Processes		
Solve problem that assesses mathematical processes	2 out of 3	
Data Representation and Interpretation		
Interpret picture graph	2 out of 3	
Solve routine problem by retrieving information from picture graph	2 out of 3	
Skill descriptors that student needs more guidance	Number of items correct	
Fractions		
Perform addition and/or subtraction on like fractions	1 out of 3	
Order fractions	0 out of 3	

Student Performance Report

Sample MathsCheck Reports

Student Guidance Report

Singapore Mathematics Skills Check (MathsCheck) - P2 Student Guidance Report

For Teacher's Use

School: XYZ Primary School
P3 Class: H

Test Period: Oct/Nov

Table of Students with Guidance Needs

Note:

** means that the student only answered 25% or fewer of the items in the area assessed correctly.

	Whole Numbers	Fractions	Money	Measurement	Mathematical Processes	Data Representation and Interpretation
Melvin Ang		*				
Mohamad Shafie Bin Hassan			*		*	*
Noorhawaṭi Binṭe Roslan				*	*	
Yong Li Yang Jonas			*			
Aishwariya d/o Muṭhusamy					*	
Shanya Fong Wen Xin	*	*			*	

Sample MathsCheck Reports

For School Leader's use

Singapore Mathematics Skills Check - P2
School Report By Topics and Skill Descriptors

School: XYZ Primary School
Size: 300

Test Period: Oct/ Nov:

By Topics

Topic	No. of students below mean	Mean (%)	Minimum (%)	Maximum (%)
Whole Numbers	98	88	11	100
Fractions	111	71	20	100
Money	78	88	0	100
Measurement	88	85	0	100
Data Representation and Interpretation	89	79	0	100
Mathematical Processes	120	61	0	81

By Skill Descriptors

Skill descriptors

Percentage of students who can manage

Whole Numbers

Recognise place values up to 1000	91
Perform 4 operations on whole numbers	90
Solve routine problem on whole numbers involving 4 operations	87

Fractions

Perform addition or subtraction on like fraction	92
Identify and represent fractions	75
Order fractions	61

School Report by Topics and Skill Descriptors

Reporting

- Schools' feedback:
 - Reports are **comprehensive** and provide support to teachers with information of individual student's learning gaps
 - Schools' leadership personnel used the reports for planning
 - Teachers used the reports to understand class performance, strengths and weaknesses by topics and weak students' performance; and to plan focused remediation
- While teachers could interpret the reports and identify areas for intervention, the **challenge lies in enacting the pedagogy** to address gaps identified in MathsCheck reports and achieve the desired learning

Macro Level Information

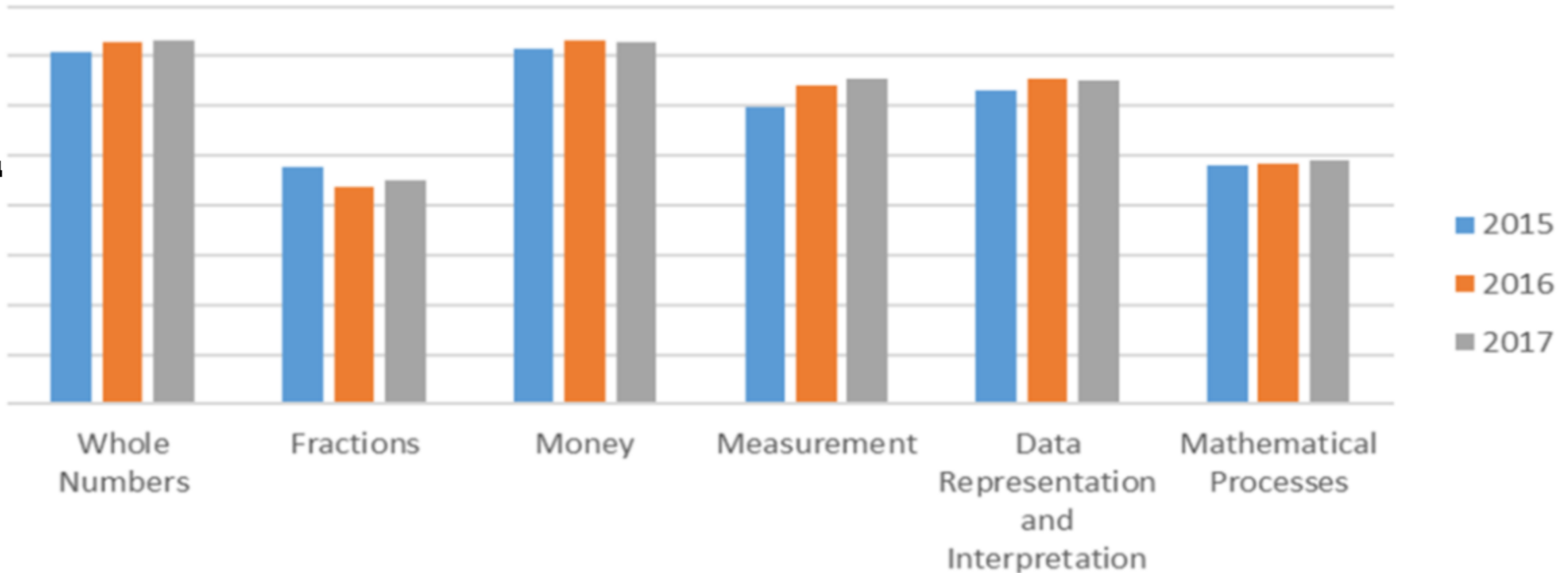
- Macro level information – aggregated information for policy and practice consideration
 - Information at a **higher** level may reveal the understanding of how young students learn Mathematics from an **otherwise unattainable perspective**.
 - With the large numbers involved, this perspective may invite ideas and ways to advance students' learning of Mathematics that is not owed to exam preparation.

Macro Level Information

- For the purpose of illustration, let us consider the following:
 - *The proportion of students in the MathsCheck population who could manage the **topics** from 2015-2017*
 - A **high proportion** of the MathsCheck population could manage the skill descriptors assessed in **Whole Numbers, Measurement and Data Representation and Interpretation**
 - **Fractions** and **Mathematical Processes** are recognised as more complex topics that these students have only just begun to learn about
 - A **baseline to establish the state of learning of young students under non-examination condition**
 - **It could help to prioritise support for some topics over others.**

Illustration

Proportion of MCP2 students who could manage ALL Skill Descriptors in topic area



Macro Level Information

- For the purpose of illustration, let us consider the following:
 - *The proportion of students in the MathsCheck population who could manage the **skills** from 2015-2017*
 - **Problem-solving skills**, as higher order skills, see lower proportions relative to the others.
 - Not all skills within even a 'difficult' topic could not be managed by most students e.g. perform addition or subtraction on like fractions
 - Some of these skills may be mapped to what is only an early exposure. **The pattern of performance could assure teachers and students that their learning is developmentally appropriate.**

Macro Level Information

- Triggering interest in further research:
 - Could Skill Descriptors be made even finer?
 - How do the skills change over time?
 - What lies behind the gap between students and their weaker peers in the learning of Mathematics?
 - How could we sharpen the precision of MathsCheck while keeping its coverage comprehensive, bearing in mind the young age of the students?

Concluding Thoughts

Concluding Thoughts

- Being mindful of **assessment concerns** and **technology available**
 - What are students using for teaching, learning and assessment? Current e-assessment capabilities?
 - Changes in technology: infrastructure (e.g. cables, wireless), hardware (e.g. computer desktops, laptops, tablets), software (e.g. versions in OS, compatibility, coding)
- Keeping in conversation with schools for **relevance** and **usefulness** of reports
 - How are they reading the reports? Using the reports?
 - What else do they need as feedback?

Concluding Thoughts

- **Balancing** the objectives of providing information as part of formative assessment and providing macro level information for high level consideration
 - Granularity of the information
 - Feedback in ways that are easy for teachers' understanding and application
 - Schools' perception of the purpose and use of information
 - How did the students perform?
 - Are there information more specific that could help them better understand each student? Each class? The whole school level?
 - Is the information used for school accountability?
 - How should they prepare their students for MathsCheck?
 - Macro level consideration of MathsCheck information
 - How are the students learning at the age of 8?
 - Are successive cohorts performing as expected?

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