

# Early Mathematics: Using the SMPs to Drive a Playful Math Experience

#### Debi DePaul Elementary Mathematics Consultant



# Learning Goals

#### Participants will understand that...

 Standards for Mathematical Practice can be employed in the classroom quite easily through the intentional act of PLAY

#### Participants will know...

- The 8 Standards for Mathematical Practice
- PLAY (Playful Learning with Accountable Yields)

#### Participants will be able to...

 begin monitoring how PLAY initiatives impact the mathematical development of your early childhood students





# 8 Standards for Mathematical Practice



- 1. Make sense of problems and persevere in solving them
- 2. Reason abstractly and quantitatively
- 3. Construct viable arguments and critique the reasoning of others
- 4. Model with mathematics
- 5. Use appropriate tools strategically
- 6. Attend to precision
- 7. Look for and make use of structure
- 8. Look for and express regularity in repeated reasoning





## 8 Standards for Mathematical Practice



1. Make sense of problems and 2. Rea persevere in solving them 3. Con 6. Attend to precision rea

Reasoning & Explaining

4. Model with mathematics 5. Use appropriate tools strategically Modeling & Using Tools

7. Look for and make use of structure 8. Look for and express regularity in repeated

reasoning

Seeing Structure & Generalizing



# What is your concept of **PLAY**?



# **Classroom Structures**

## **Partner Reflection:**

 What classroom structures need to be in place so that students are engaged in the math practices?

 Share an example or two of when you saw students learning through PLAY. What did you notice?





## 8 Standards for Mathematical Practice

p.1

 Make sense of problems and persevere in solving them
 Attend to precision

<ol> <li>Reason abstractly and quantitatively</li> <li>Construct viable arguments and critique the reasoning of others</li> </ol>	Reasoning & Explaining
<ul><li>4. Model with mathematics</li><li>5. Use appropriate tools strategically</li></ul>	Modeling & Using Tools
<ul><li>7. Look for and make use of structure</li><li>8. Look for and express regularity in repeated reasoning</li></ul>	Seeing Structure & Generalizing





# Mathematical Practices 1 and 6

p.1

2. Reason abstractly and qu	uantitatively
-----------------------------	---------------

3. Construct viable arguments and critique the reasoning of others

Reasoning & Explaining

4. Model with mathematics5. Use appropriate tools strategically

Modeling & Using Tools

7. Look for and make use of structure

8. Look for and express regularity in repeated

reasoning

Seeing Structure & Generalizing



## Create a classroom culture...

## ...that empowers this





## NOT this



## Tinker Time



## Tinker Time *kikan-shido* (between the desks)

"The process of roving among desks to monitor and assist students' independent or collaborative work."

- Monitoring student activity
- Guiding student activity
- Organizing materials and the physical setup
- Engaging students in social talk







# Put ourselves in their shoes...



A hall has chairs arranged in rows of 8. There are 3 tables and 45 rows of chairs. How many people can be seated in chairs?





ORIGO-

ORIGO Stepping Stones, Grade 4

#### \*This is a framework.

**Proving/Explaining** 

#### A Question or a Problem

"What do I know?"

"What am I trying to figure out?"



p.3

#### Tinkering

"Let me try..."

"I think I know where I can start..."

#### Models/Tools

"Can I do this mentally?"

"Do I need to draw it out or use a model?"

"Do I need some other tool to show my thinking?"



#### Aha!

"I think this will work!"

"I understand what to do next!"

"I got it!"

#### Stumped!

"I don't get it!"

"Do I understand the question?"

"Argh! I want to give up!"

#### Systematic Tinkering

"Now that I've seen a pattern, let me keep trying..."

C. Charney and J. Maxfield

Pattern Sniffing/Observations

"Hmmm... I notice..."

"I wonder if..."







C. Charney and J. Maxfield

# Mathematical Practices 1 and 6

# ...serve as the umbrella for ALL the other Mathematical Practices



## Mathematical Practices 2 and 3 Reasoning & Explaining



 Make sense of problems and persevere in solving them
 Attend to precision 2. Reason abstractly and quantitatively
 3. Construct viable arguments and critique the reasoning of others
 4. Model with mathematics

4. Model with mathematics5. Use appropriate tools strategically

Modeling & Using Tools

7. Look for and make use of structure

- 8. Look for and express regularity in
  - repeated reasoning

Seeing Structure & Generalizing



## Create a Classroom Culture Student Discourse



## What is discourse?

- Ways of representing, thinking, talking, agreeing, and disagreeing
- Having a community of learners where a safe environment is present



# Puppet Addition and Subtraction

- In pairs, create a one-step addition or subtraction word problem on a blank sheet of paper.
- Switch word problems with another group.
- Solve the problem by using the tinker mat.
  - Share your problem, solution, and justification to the table using your puppet.



# How did you engage in....

- Problem solving? (SMP 1)
- Perseverance? (SMP 1)
- Precision? (SMP 6)
- Discourse? (SMPs 2 and 3)
- Explaining and/or critiquing? (SMPs 2 and 3)
- PLAY?



## Mathematical Practices 4 and 5 **Modeling & Using Tools**



Make sense of problems and persevere in solving them Attend to precision

9

2. Reason abstractly and quantitatively Reasoning & 3. Construct viable arguments and critique the Explaining reasoning of others 4. Model with mathematics Modeling & 5. Use appropriate tools strategically Using Tools 7. Look for and make use of structure Seeing Structure 8. Look for and express regularity in repeated & Generalizing reasoning



## Mathematical Practices 4 and 5 Modeling & Using Tools





Models	Tools					
representations of abstract math ideas	support students to perform a task					
Examples:	Examples:					
numbers	concrete materials					
• symbols	strategies					
• objects	– mental math					
diagrams	– estimation					
graphic organizers						





<u> </u> 8	<u> </u> 8			8	<u> </u> 3		<u> </u> 8	<u> </u> 8			1 8			8		<u> </u> 8
<del> </del> 3						<u> </u> 3					<u> </u> 3					
16	<u> </u> 6		<u> </u> 6				$\frac{1}{6}$ $\frac{1}{6}$				$\frac{1}{6}$ $\frac{1}{6}$			<u> </u> 6		
$\frac{1}{12}$	<u> </u>  2		1 12	<u> </u>  2	   2	ī	<u> </u>  2	$\frac{1}{12}$	- <u> </u> [;	12	ī	<u> </u> 2	1 12	•	$\frac{1}{12}$	<u> </u>  2
	<u> </u> 5			 5		<u> </u> 5			<u> </u> 5		<u> </u> 5				-	5
<u> </u> 10	<u> </u>  0		10		<u> </u> 10		<u> </u> 10	<u> </u> 10		$\frac{1}{10}$		10	5		1 10	<u> </u> 10





1	2	3	4	5	6	7	8	9	10
5	·	j		·				.d	

	2	3	4	5	6	7	8	٩	10
Ш	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
ଞା	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100







pp. 5-6



Cube A: Just Before, Just After, Before, After, Before, After

**Cube B:** 7, 8, 9, 10, 11, 12

### **How to Play**

- Each player will get 8 counters of the same color. Each player needs a different color.
- Roll the cube and place one counter according to the roll. If the space is not available, you miss a turn.
- Play continues until a counter has been placed on each space of number track.



**ORIGO Fundamentals** 

# How did you engage in....

- Problem solving? (SMP 1)
- Perseverance? (SMP 1)
- Precision? (SMP 6)
- Discourse? (SMPs 2 and 3)
- Explaining and/or critiquing? (SMPs 2 and 3)
- Using models/tools? (SMPs 4 and 5)
- PLAY?



## Mathematical Practices 7 and 8 **Seeing Structure & Generalizing**



1. Make sense of problems and persevere in solving them Attend to precision Ö

reasoning

<ol> <li>Reason abstractly and quantitatively</li> <li>Construct viable arguments and critique the reasoning of others</li> </ol>	Reasoning & Explaining
<ol> <li>Model with mathematics</li> <li>Use appropriate tools strategically</li> </ol>	Modeling & Using Tools
<ul><li>7. Look for and make use of structure</li><li>8. Look for and express regularity in repeated</li></ul>	Seeing Structure & Generalizing



## Mathematical Practices 7 and 8 Seeing Structure & Generalizing

Mathematical Practice 7	<b>Mathematical Practice 8</b>
Understand the structure of mathematics	Notice repetition and discover shortcuts and generalizations
<ul> <li>See the flexibility of numbers</li> <li>Discover properties</li> </ul>	<ul><li>Explore repetition</li><li>Find shortcuts</li></ul>
<ul> <li>Recognize patterns and functions</li> </ul>	
	Putting the Practices into Action





Mathematical Practice 7

### **Recognizing Patterns**

Number Track

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19
---

Hundi	reds Ch	art							
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

Addition Chart											
+	0	1	2	3	4	5	6	7	8	9	
0	0	1	2	3	4	5	6	7	8	9	
1	1	2	3	4	5	6	7	8	9	10	
2	2	3	4	5	6	7	8	9	10	11	
3	3	4	5	6	7	8	9	10	11	12	
4	4	5	6	7	8	9	10	11	12	13	
5	5	6	7	8	9	10	11	12	13	14	
6	6	7	8	9	10	11	12	13	14	15	
7	7	8	9	10	11	12	13	14	15	16	
8	8	9	10	11	12	13	14	15	16	17	
9	9	10	11	12	13	14	15	16	17	18	

Mul	tipl	icatior	n Chart
-----	------	---------	---------

x	0	1	2	3	4	5	6	7	8	9
0	0	0	0	0	0	0	0	0	0	0
1	0	1	2	3	4	5	6	7	8	9
2	0	2	4	6	8	10	12	14	16	18
3	0	3	6	9	12	15	18	21	24	27
4	0	4	8	12	16	20	24	28	32	36
5	0	5	10	15	20	25	30	35	40	45
6	0	6	12	18	24	30	36	42	48	54
7	0	7	14	21	28	35	42	49	56	63
8	0	8	16	24	32	40	48	56	64	72
9	0	9	18	27	36	45	54	63	72	81



# On the Edge

	2	3	4	5	6	7	8	۹	10
П	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

## Cube: 1, 2, 3, 10, 20, 30

## How to Play

- Both players place their counter on number 1.
- Roll the cube and move your counter according to the roll. If the space is not available, you miss a turn.
- Play continues until a player lands on the shaded area.



pp. 8-9

**ORIGO Fundamentals** 

# How did you engage in....

- Problem solving? (SMP 1)
- Perseverance? (SMP 1)
- Precision? (SMP 6)
- Discourse? (SMPs 2 and 3)
- Explaining and/or critiquing? (SMPs 2 and 3)
- Using models/tools? (SMPs 4 and 5)
- Seeing structure? (SMP 7)
- Generalizing? (SMP 8)
- PLAY?



# Reflection

 How does using the PLAY initiative boost student's self-esteem, language development, and retention?

 How does using the Standards for Mathematical Practice generate positive math vibes and security?



# Learning Goals

#### Participants will understand that...

 Standards for Mathematical Practice can be employed in the classroom quite easily through the intentional act of PLAY

#### Participants will know...

- The 8 Standards for Mathematical Practice
- PLAY (Playful Learning with Accountable Yields)

#### Participants will be able to...

 begin monitoring how PLAY initiatives impact the mathematical development of your early childhood students





# Thank You



