



IMPLEMENTING ENGAGENY: PITFALLS AND CELEBRATIONS

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Jerome Bruner: Concrete Pictorial Abstract

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ZOLTAN DIENES

Theory of Variability



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MATHEMATICAL VARIABILITY

- Example: Kindergarten lesson on triangles



Module 2 Topic A Lesson 2



JEROME BRUNER



“Spiral curriculum”

Topic is introduced in the tight part of a spiral.

Spiral opens up, short review and deeper investigation.



Example: Fractions

1st grade: What is a half? What is a fourth?

Apply by telling time to $\frac{1}{2}$ hr.

2nd grade: What is a half? What is a fourth?

Whole Parts; Parts Whole →

Halves, thirds, fourths

Equal PARTS, not same SHAPES

Apply by telling time to 5 minutes



3rd grade fractions: **35 days**

4th grade fractions: **40 days**

5th grade fractions: **60 days**



K – 5 A STORY OF UNITS



FLUENCY

- 8-12 minutes of higher energy activities that allow students to see measureable progress
- Daily, substantial, sustained, and supported by the lesson structure
- Intended to promote automaticity – allowing students to reserve their cognitive energy for higher-level thinking



APPLICATION PROBLEM

- Word problems intended to encourage independent problem solving, choosing appropriate strategies and skills
- Usually 7-12 minutes of total lesson time
- The Read, Draw, Write (RDW) process is encouraged during this phase of the lesson
- Opportunity for formative assessment in some cases



CONCEPT DEVELOPMENT & PROBLEM SET

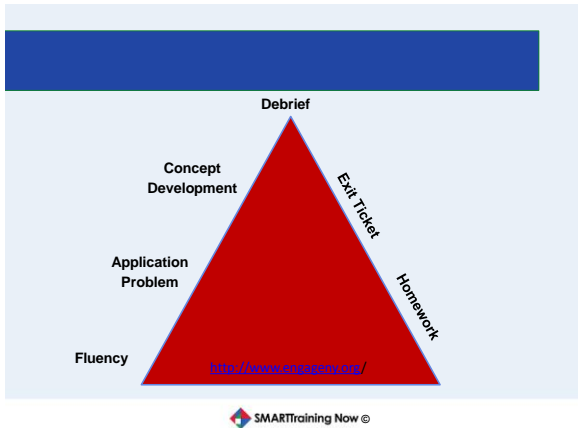
- Constitutes the major portion of instruction – the new learning.
- In general progresses from concrete to pictorial to abstract.
- Accompanied by sequenced problem sets in the form of reproducible student sheets.



DE-BRIEF

- Encourages students to articulate the focus of the lesson and the learning that has occurred.
- Student work is shared and analyzed with a focus on promoting mathematical conversation with and among all students.
- Followed by an “Exit ticket” which covers most essential content from lesson.
- All lessons include a homework assignment that follows the format of the “Practice Set.”





EXIT TICKET

- **MUST** be completed every day by every student **INDEPENDENTLY**.
- Can be used as formal assessment or simply as information about student progress.

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HOMEWORK

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6 – 8 A STORY OF RATIOS



CLASSWORK

- Examples
- Exercises
- Exploratory challenges
- Discussion



CLOSING

- Usually a question for students to answer
- There is a lesson summary after every lesson. That is for the teacher's information.



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PROBLEM SET



SO WHAT ARE THE PROS AND CONS?



NUMBER SENSE

What does that mean?

Where does it come from?

Do young students today have as much number sense as students did 25 years ago?

How can teachers help students develop number sense?



NUMBER SENSE

“Number sense can be described as good intuition about numbers and their relationships. It develops gradually as a result of exploring numbers, visualizing them in a variety of contexts, and relating them in ways that are not limited by traditional algorithms”.

Hilde Howden (1989)



WAYS OF BUILDING NUMBER SENSE

- Estimating
- Which has more? **Less?**

• Subitizing 

- Mental Math all day every day



PROBLEM SOLVING



TAPE DIAGRAMS

Tape diagrams are an ingenious problem-solving strategy with which students are taught to visualize and construct "pictures" to help them make sense of word problems.

Tape diagrams are said to solve about 80% of all word problems encountered through pre-algebra.

Tape diagrams serve as an amazing link to algebra.



PRACTICE PROBLEMS

Juan, Maria and Sara collected 130 stamps altogether.
Juan collected 3 times as many stamps as Maria.
Sara collected 34 stamps.
How many stamps did Juan collect?

Note: We never say 3 times more. That makes for a confusing problem.



PRACTICE PROBLEMS

Tyrone bought a bag of marbles. $\frac{1}{4}$ of the marbles were blue, $\frac{1}{8}$ were green and $\frac{1}{5}$ of the remainder were yellow. If there were 24 yellow marbles, how many marbles did he buy?



TEACHING TO MASTERY VS. EXPOSURE



SEQUENCE OF THE CURRICULUM



Be SURE to read each module overview carefully!



TIME REQUIRED FOR A LESSON



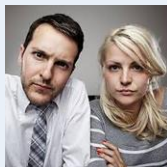
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THE HIGHER THE GRADE LEVEL...



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