IOWA

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Helping Students Read Mathematics

Math In Action Session B-3

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Plan for this session – Session B-3

- Background
  - Components of Literacy
  - Studies
- Preparation
- Action
  - Read-aloud
  - Assessment
- Bottom Line

Background

Literacy and Prior Studies

When considering "literacy" … you'd think …

Reading is (according to Perfetti, 1984)

(1) "thinking guided by print"

(2) "translation of written elements into language"

Writing

Generating print guided by thinking

A way to express thinking

Speaking

Thoughts to words

Communicating to other

When considering "literacy" … researchers say …

Hildreth (1947)

The three R's – Reading, wRiting, and aRithmetic ... "tools that equip people for intelligent participation in daily life" (p. 1)

Gibbons (2009)

"Literacy involves the integration of listening, speaking, reading, writing, and critical thinking and includes the cultural knowledge that enables a speaker, writer, or reader to recognize and use language appropriate to different social situations" (p. 7)

OECD (2013)

The parent organization of the PISA exam suggest that mathematically literate students to formulate, employ, explain, describe, and interpret a variety of mathematical texts

Preparation

Strategy outline and instructions

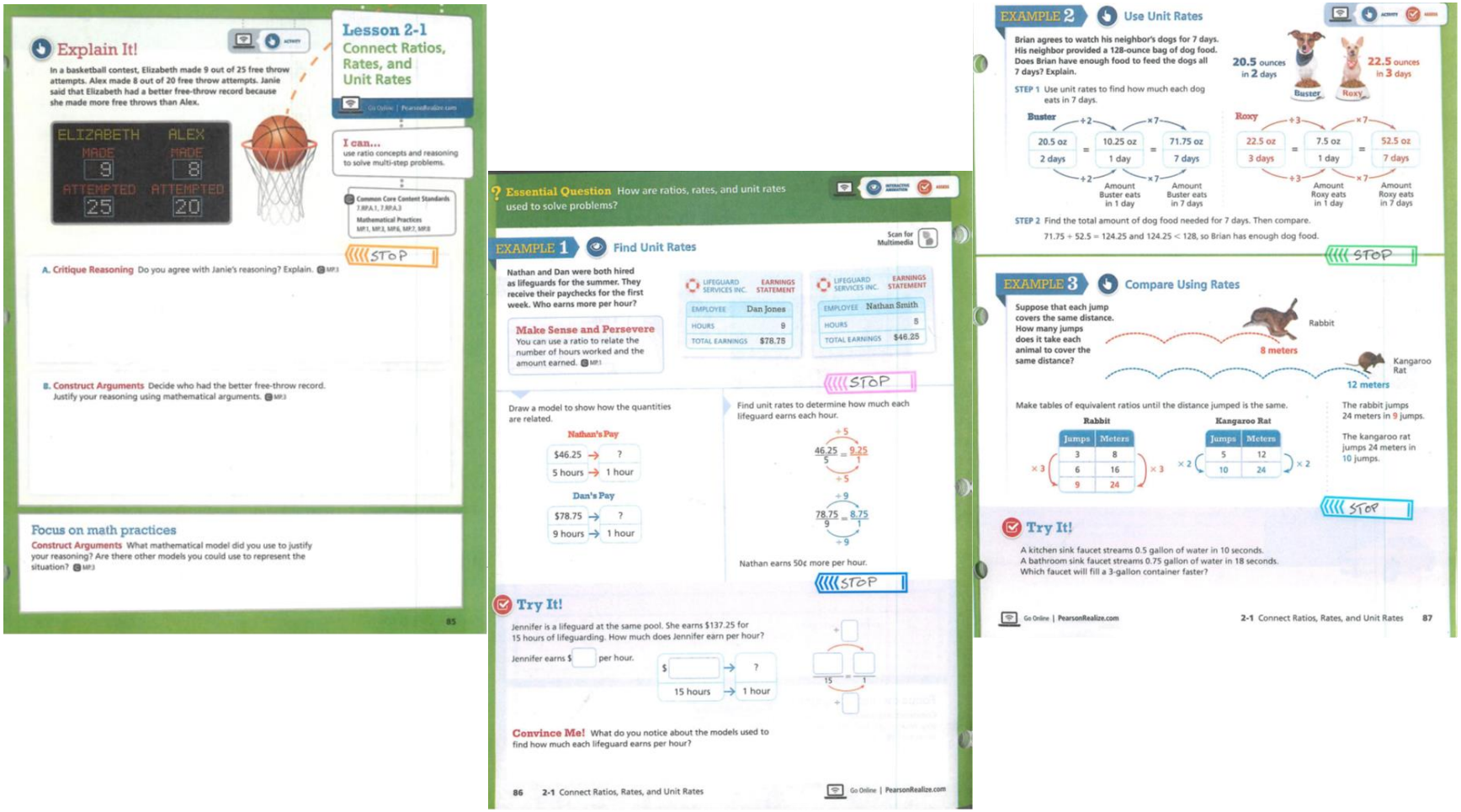
This Study

Twenty-two 1-on-1 interviews with 7th graders

Read aloud a 3-page passage from Pearson's envisionMath 2.0

A focus on how students read through the text

Passage Excerpt



Explain It!

In a basketball contest, Elizabeth made 9 out of 25 free throw attempts. Alex made 8 out of 20 free throw attempts. Janie said that Elizabeth had a better free-throw record because she made more free throws than Alex.

	ELIZABETH	ALEX
MADE	9	8
ATTEMPTED	25	20

Lesson 2-1
Connect Ratios, Rates, and Unit Rates

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I can...
use ratio concepts and reasoning to solve multi-step problems.

Common Core Content Standards
7.RP.A.1, 7.RP.A.3
Mathematical Practices
MP.1, MP.3, MP.6, MP.7, MP.8

STOP

A. Critique Reasoning Do you agree with Janie's reasoning? Explain. MP.3

B. Construct Arguments Decide who had the better free-throw record. Justify your reasoning using mathematical arguments. MP.3

Focus on math practices

Construct Arguments What mathematical model did you use to justify your reasoning? Are there other models you could use to represent the situation? MP.3

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Essential Question How are ratios, rates, and unit rates used to solve problems?

EXAMPLE 1 Find Unit Rates

Scan for Multimedia

Nathan and Dan were both hired as lifeguards for the summer. They receive their paychecks for the first week. Who earns more per hour?

LIFEGUARD SERVICES INC.	EARNINGS STATEMENT
EMPLOYEE	Dan Jones
HOURS	9
TOTAL EARNINGS	$78.75

LIFEGUARD SERVICES INC.	EARNINGS STATEMENT
EMPLOYEE	Nathan Smith
HOURS	8
TOTAL EARNINGS	$46.25

Make Sense and Persevere
You can use a ratio to relate the number of hours worked and the amount earned. MP.1

STOP

Draw a model to show how the quantities are related.

Nathan's Pay

$46.25 → ?
5 hours → 1 hour

Dan's Pay

$78.75 → ?
9 hours → 1 hour

Find unit rates to determine how much each lifeguard earns each hour.

$\frac{46.25}{5} = \frac{9.25}{1}$ (÷5)

$\frac{78.75}{9} = \frac{8.75}{1}$ (÷9)

Nathan earns 50¢ more per hour.

STOP

Try It!

Jennifer is a lifeguard at the same pool. She earns $137.25 for 15 hours of lifeguarding. How much does Jennifer earn per hour?

Jennifer earns $ ____ per hour.

$ ____ → ?
15 hours → 1 hour

Convince Me! What do you notice about the models used to find how much each lifeguard earns per hour?

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EXAMPLE 2 Use Unit Rates

Brian agrees to watch his neighbor's dogs for 7 days. His neighbor provided a 128-ounce bag of dog food. Does Brian have enough food to feed the dogs all 7 days? Explain.

20.5 ounces in 2 days — Buster
22.5 ounces in 3 days — Roxy

STEP 1 Use unit rates to find how much each dog eats in 7 days.

Buster (+2, ×7)

20.5 oz	=	10.25 oz	=	71.75 oz
2 days		1 day		7 days

Amount Buster eats in 1 day; Amount Buster eats in 7 days

Roxy (+3, ×7)

22.5 oz	=	7.5 oz	=	52.5 oz
3 days		1 day		7 days

Amount Roxy eats in 1 day; Amount Roxy eats in 7 days

STEP 2 Find the total amount of dog food needed for 7 days. Then compare.

71.75 + 52.5 = 124.25 and 124.25 < 128, so Brian has enough dog food.

STOP

EXAMPLE 3 Compare Using Rates

Suppose that each jump covers the same distance. How many jumps does it take each animal to cover the same distance?

Rabbit — 8 meters
Kangaroo Rat — 12 meters

Make tables of equivalent ratios until the distance jumped is the same.

Rabbit

Jumps	Meters
3	8
6	16
9	24

(×3, ×3)

Kangaroo Rat

Jumps	Meters
5	12
10	24

(×2, ×2)

The rabbit jumps 24 meters in 9 jumps.

The kangaroo rat jumps 24 meters in 10 jumps.

STOP

Try It!

A kitchen sink faucet streams 0.5 gallon of water in 10 seconds. A bathroom sink faucet streams 0.75 gallon of water in 18 seconds. Which faucet will fill a 3-gallon container faster?

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Observed Reading Strategies

Most observed strategies

Strategy (students)	Strategy (separate implementations)
Paraphrase text (22)	Read aloud (104)
Plan a solution or predict result (22)	Plan a solution or predict result (97)
Self-Check (21)	Pause to reflect (89)
Question or critique the text (21)	Paraphrase text (86)
Pause to reflect (21)	Self-Check (77)

Least observed strategies

Strategy (students)	Strategy (separate implementations)
Creates a Mental Image (2)	Decoding (2)
Decoding (2)	Creates a Mental Image (4)
Make Notes While Reading (6)	Make Notes While Reading (7)
Skim the Text (7)	Skim the Text (7)

Surprises

Making Notes

Skimming

Question or Critique text

Action

Partnered read-aloud and assessment

Our Activity

Preparation

(1) Partner up (2) Decide who is reading first

(3) Get ready to take notes (4) Alternate reader with each exercise

Reading

When playing the "reader" - (1) Read and work out loud (2) Share any/all thoughts

When playing the "noter" - (1) Document things of interest (2) Remind your partner to work out loud (3) Try to identify strategies used to understand the text

Reflection

We'll do this as a group … Focusing on

(1) What did you observe? (2) What did that allow your partner to accomplish?

Bottom Line

Final thoughts, questions

Final Thoughts

Your students are reading their mathematical text

They're employing strategies from ELA (and elsewhere)

We should identify then model strategies that help understanding

Questions?

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